plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

AUGUST 1957

Water and Waste Treatment

University Microfilms
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Ann Arbor, Michigan

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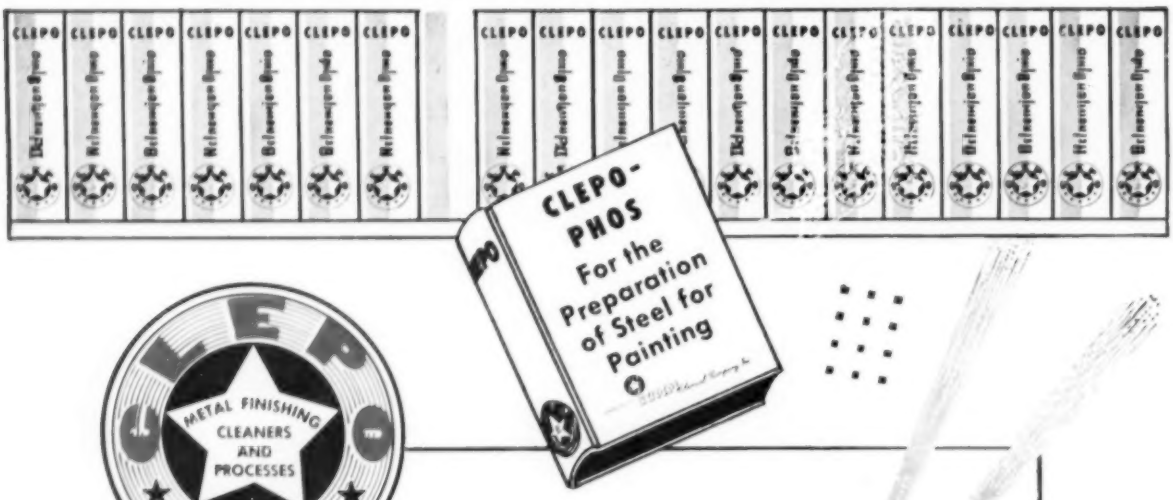

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Clepo-Phos *Conditions* STEEL WHILE IT CLEANS

Reduces Foaming and Scaling to a Miniumum

CLEPO-PHOS so conditions the surface of the steel to be painted that it will anchor the coating firmly to the surface. Unconditioned surfaces produce poor bond, whereas a CLEPO-PHOS conditioned surface produces a lasting bond with the paint.

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• • •

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Emulsion Cleaner 75

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SIMPLE OPERATION . . . MANY ADVANTAGES

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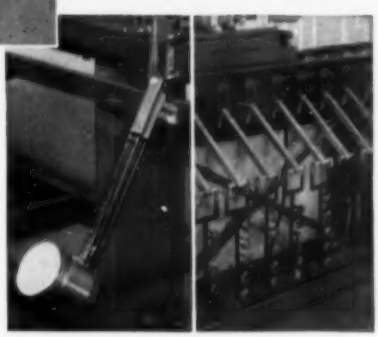
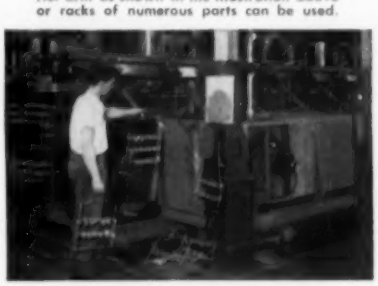
For further information about "LITTLE STEVE" write for illustrated folder or call your local Stevens sales engineer.



A single part can be placed on each carrier arm as shown in the illustration above or racks of numerous parts can be used.



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Journal of the American Electroplaters' Society

August 1957 — **Vol. 44, No. 8**

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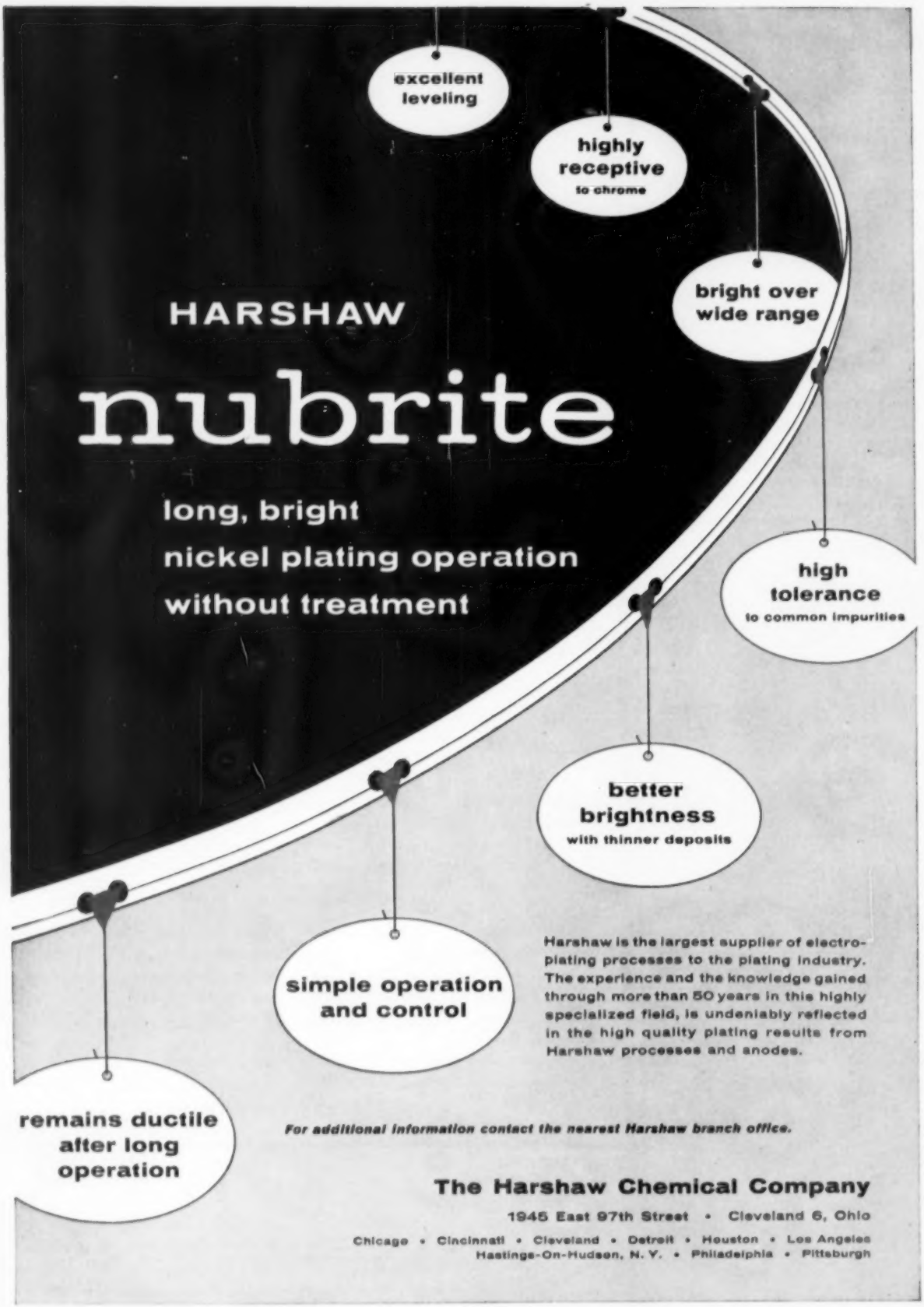

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EDITORIAL

THE VIGOR OF YOUTH

EACH YEAR, in the spring, nature renews herself in the form of flowers, lambs, ideas, determination and in many other ways. In AES, too each year we elect a new administration to carry on the Society's work for another period.

Each group of men, as they take the helm, strive to do the best for all the Society and all its members. Committees are formed, plans are made, action is taken and results are counted. In some way, every member of AES should be in this activity; every member can do a significant part of the over-all program. It is the several Committees' aim, working in conjunction with the Executive Board, to get you interested in the aims, purposes, objectives and action of the Society. Your help is needed to make the AES history of tomorrow—*today*.

All of us will work hard with all our energies to lay a good record before the 1958 Convention in Cincinnati. With the new organization becoming active in the fall months, we shall have new and old business, new and old fun with new and old friends—but even so, there will be a new change in 1958.

Each year this change takes place, each year the Society grows stronger, each year the new group pushes forward and each year work is accomplished. This is the vigor of youth—48 years of youth. This youth is YOU; it is of you, by you and for you!

Francis J. Eddy

President

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TO OUR ADVERTISERS, ADVERTISING AGENCIES AND FRIENDS

PLATING, official journal of the American Electroplaters' Society, has just been admitted to membership in the Audit Bureau of Circulations (ABC), and this message is intended to announce that fact to you.

As advertising patrons, advertising prospects or just friends of this monthly magazine, we want to share with you the good news of this latest milepost of progress in the 44-year life to date of PLATING.

To now, our Advertisers have relied for PLATING'S circulation data upon the assurance of the American Electroplaters' Society (AES)—word backed by the global prestige and reputation of this nearly half-century old professional Society.

From now on, paid circulation data will be reported, in our behalf, by ABC—data resulting from periodical on-the-spot audit by ABC circulation examiners on the basis of exacting ABC standards.

To attain membership in the ABC, a publication must meet and maintain specific standards in building and servicing its circulation audience. We hope that you share our pride that PLATING circulation conforms with ABC's strict rules, the highest standards the advertising and publishing industry has established.

We value, appreciate, solicit your advertising. We hope that you will use PLATING to the limit in targeting your "sell" to the vast purchasing power that it serves. Call or write our Advertising Manager. His mission is to exert every possible effort to serve you helpfully.

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DIVISION OF UNITED AIRCRAFT CORPORATION

STRATFORD, CONNECTICUT

November 15, 1956

Industrial Waste Treatment Dept.
Graver Water Conditioning Co.
216 West 14th Street
New York 11, N. Y.

Gentlemen:

You will be interested in the results of a recent, nation-wide survey of State Health and Water Pollution agencies. The aim of this survey was to compose a National Honor Roll of the most prominent industrial waste treatment projects put into operation during 1955-1956.

The Sikorsky waste facilities, which include five Graver Rota-Rake Sedimentation units for the disposal of plating and other wastes, was chosen as the outstanding plant in the State of Connecticut.

Very truly yours,
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Nelson H. Downs

Nelson H. Downs
Assistant to the
General Manager

NHD:ss

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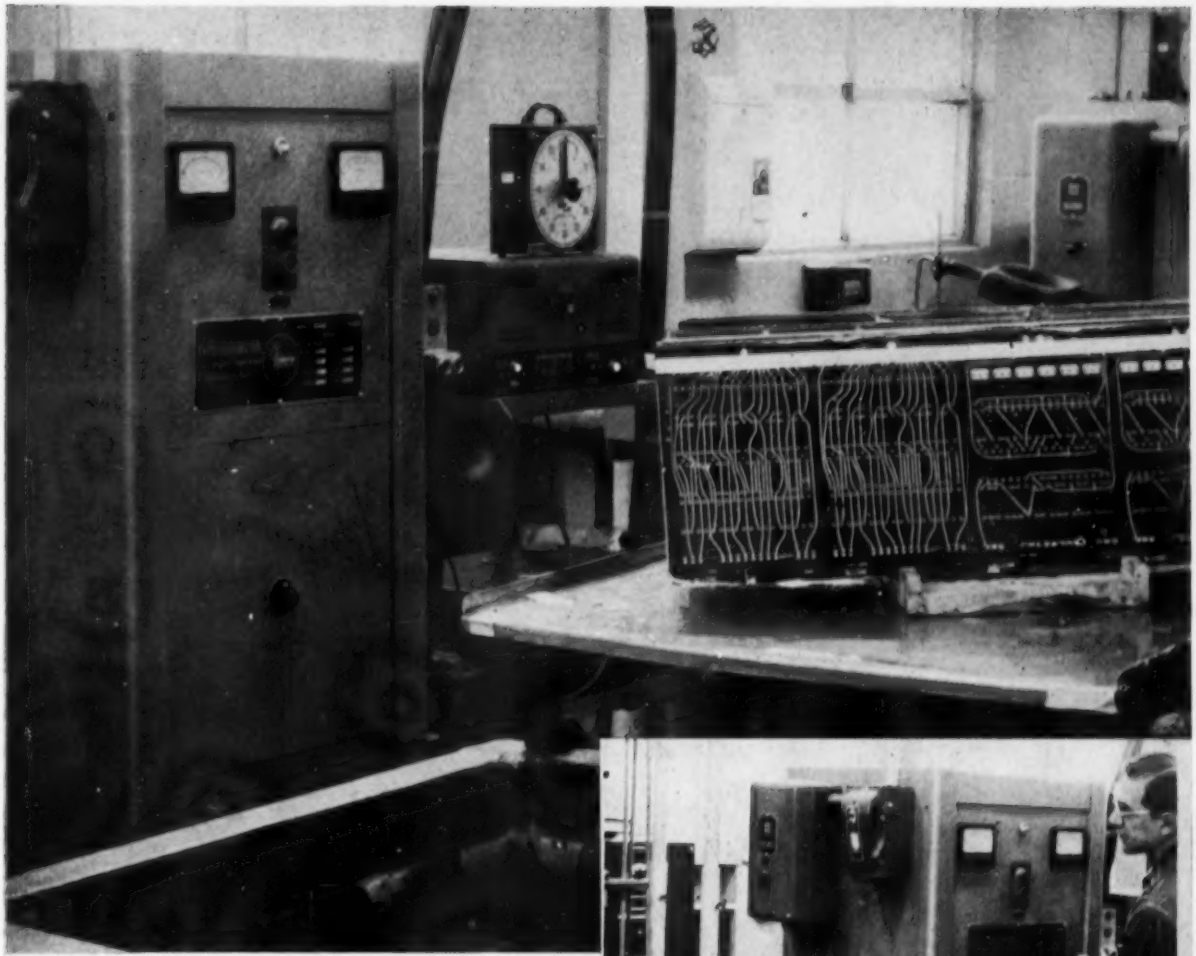

I B M installs Automatic current controlled* units at Poughkeepsie plant.

IBM's Poughkeepsie, New York, plant is now achieving more uniform plating on Printed Wiring Boards since installing RAPID ELECTRIC constant current* rectifiers

Automatic control of current density relieves the operator from making constant adjustments as panels are loaded and unloaded from the plating tanks. *One setting* permits closer plating tolerances, while achieving greater control of hole sizes on through-hole plating.

At Poughkeepsie, RAPID constant current rectifiers are used on copper and tin-lead Printed Wiring Boards for IBM Card Punch, Electronic Calculator, and Data Transceiver equipment. With Automatic current density control IBM has eliminated the danger of burning due to over current and over plating. Time lost in estimating current settings for corresponding plating areas is non-existent.

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*INDICATE A 805.

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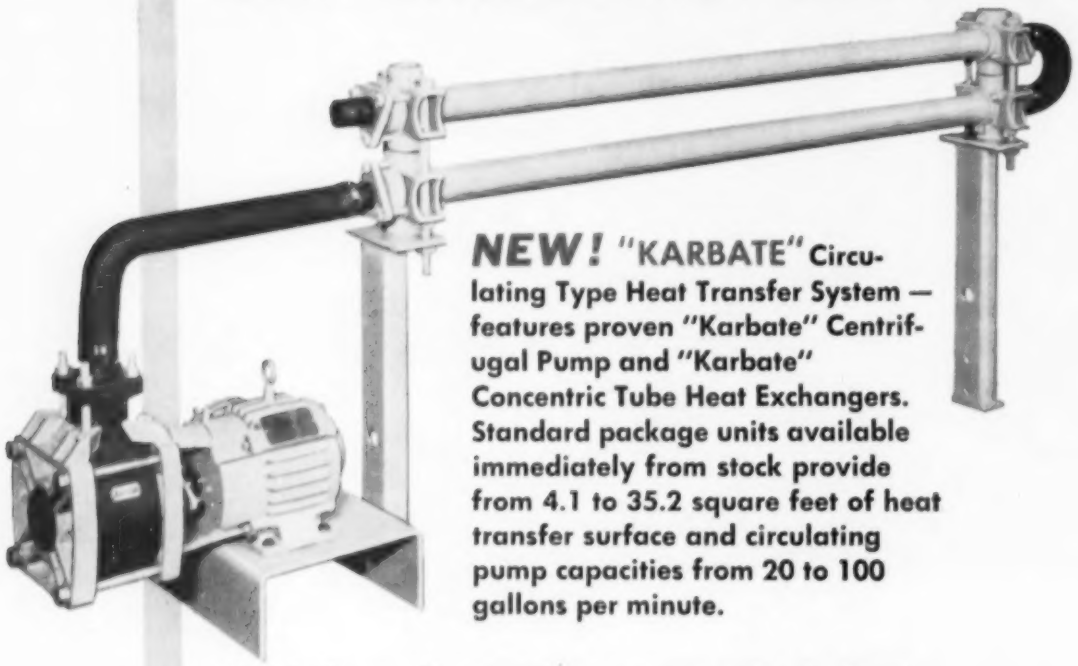

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Wagner Brothers, pioneers in nickel anode recasting, offer you an opportunity to regain your rightful profit. Our reputation is your assurance of highest metal quality, low dross loss and turnaround delivery and the cost of this service is pennies per pound. To get started on the road to cost reduction, simply fill out the coupon below. The detail you furnish us will expedite proper handling of your order.

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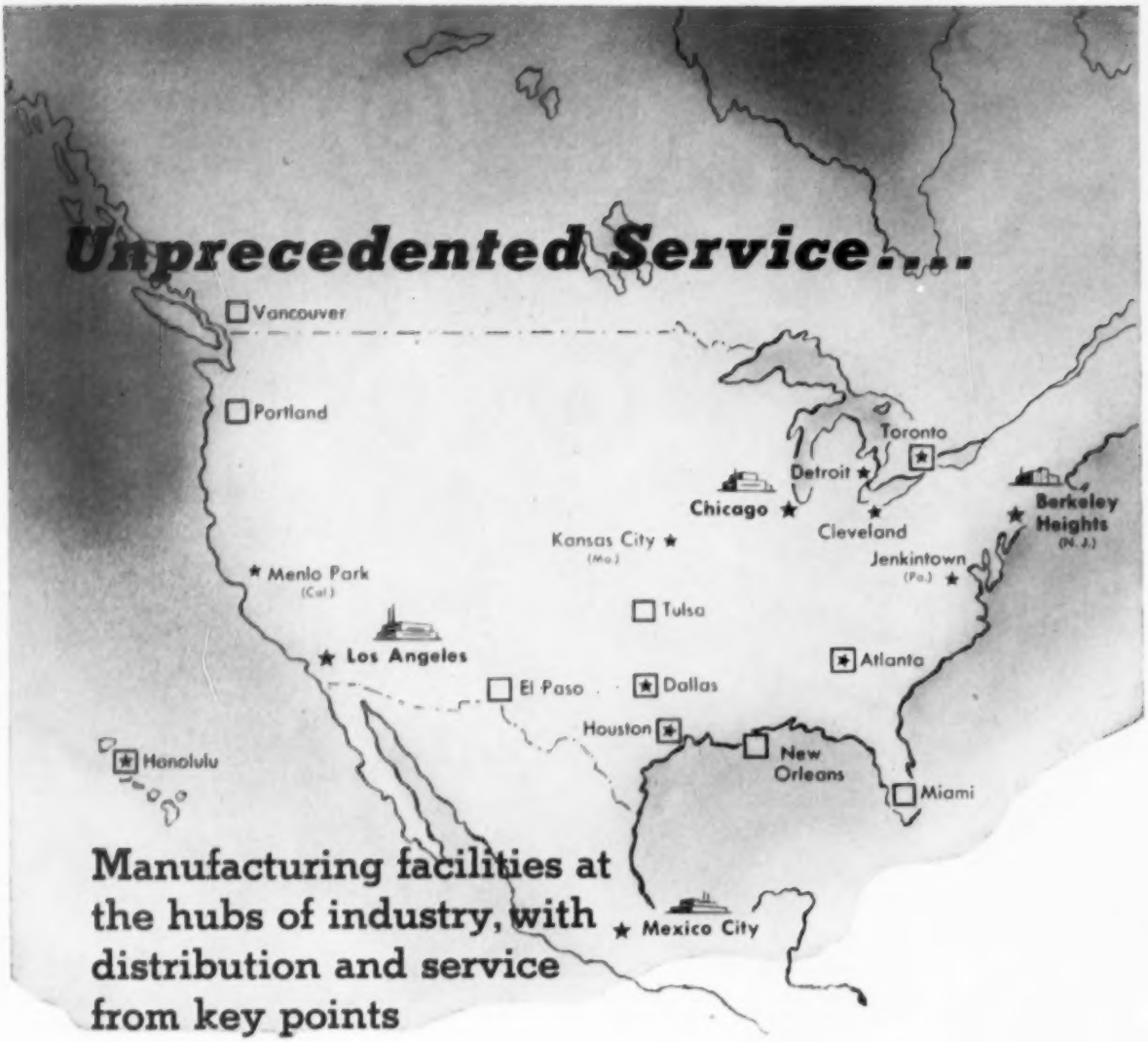

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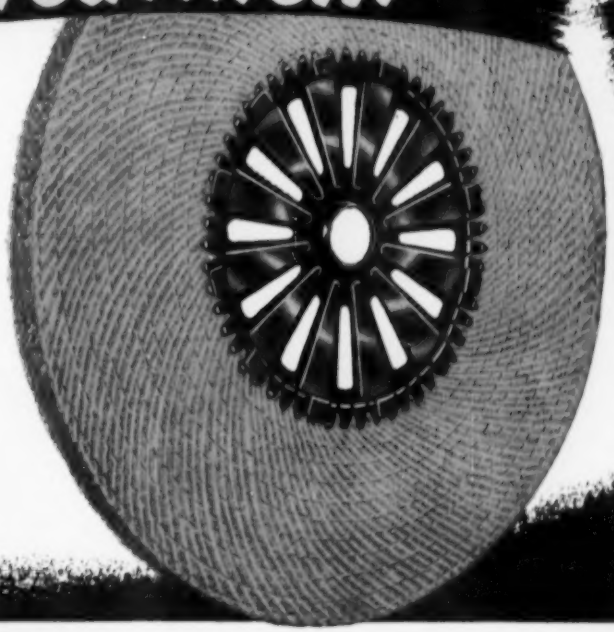

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to resist fraying and give longer wear

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SECOND, it gives the buff *firmer body*, without extra stiffness.

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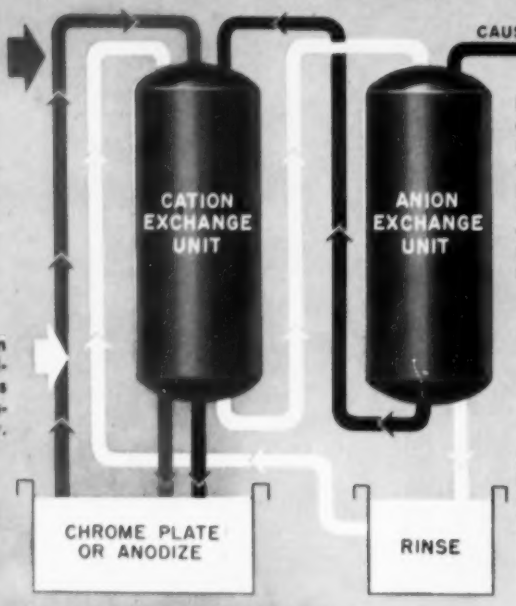
How Ion Exchange Cuts Plating Costs

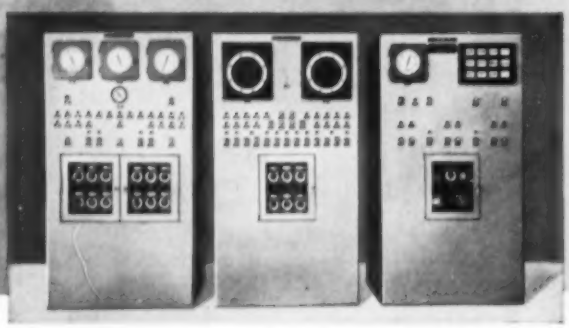
RENEWS PLATING BATH. This cycle removes aluminum, copper, iron and other impurities . . . allows continued re-use of bath . . . eliminates disposal problem. Compared with the usual toxic-waste disposal equipment, ion exchange saves up to 50% on initial costs, 75% on operating costs, 80% on floor space.

RENEWS RINSE WATER. Cation unit removes metallic impurities . . . anion unit removes chromic acid . . . allowing continued reuse of rinse water. Cuts consumption 90%!



RECLAIMS CHROMATE. This cycle picks up chromic acid removed from the rinse water and returns it to the plating bath. Chromate saved in the plating bath and rinse water often pays for the entire ion exchange installation!

SAVINGS FOR SMALL PLANTS. Ion exchange economies apply to small plating plants as well as large.



AUTOMATIC CONTROLS for ion exchangers in an auto parts plating plant. These controls simplify operation. No specially trained operators or technicians required.

©The Permutit Company

Ion Exchange Cuts Process Costs

Modern ion exchange equipment really pays off for plating plants. Here's why:

Faster production. Dip periods are shorter, and there's no down-time for dumping because baths are always at full strength. Time savings are biggest for bright-dipping, anodizing, etching, stripping.

Better quality. Clean baths produce more uniform plating deposits. Clean rinses prevent water stains and spots.

Lower operating costs. Contaminant-free baths use less current. The improved quality means fewer rejects . . . and reduced polishing and wiping costs. A large aircraft manufacturer saved $10,000 on anodizing in the first year with ion exchange. A leading auto maker prevented a stream pollution shut-down, improved quality, reduced costs . . . and uses the same ion exchange equipment for treating other process water in the plant!

Largest manufacturer of ion exchange equipment, The Permutit Company, is the only firm that offers a complete ion exchange service: rinse water or bath analysis, engineering, equipment, ion exchange resins and automatic controls . . . *all from one source.*

For details, write: The Permutit Company, Dept. PL-8, 330 West 42nd St., New York 36, N. Y.

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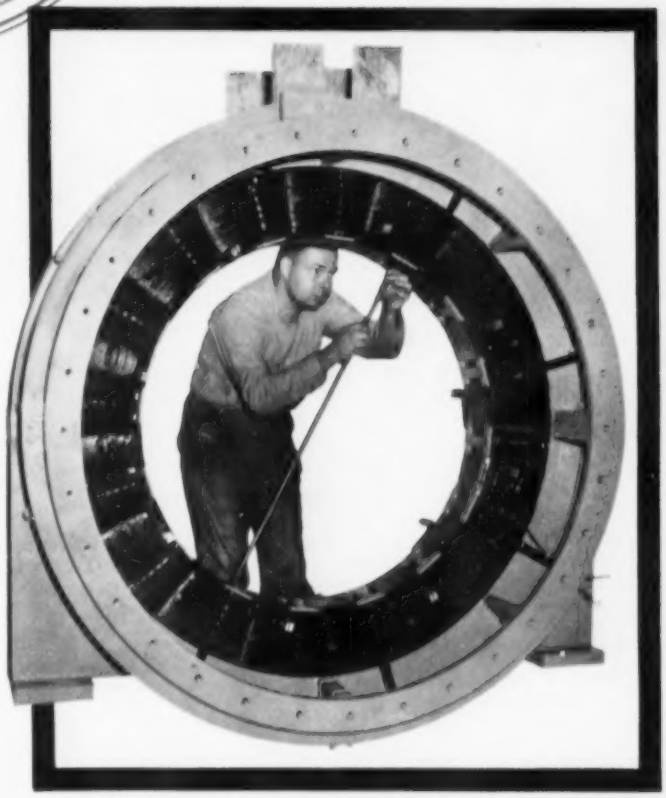
assures long life, lower maintenance costs —by far



All poles on Chandeysson Generators are micrometer accurately positioned to assure sparkless commutation and long brush life, 20,000 hours on the average. Even when brushes need to be replaced . . . and brushes are the *only* replacement item in a motor-generator set . . . they represent only 2% of the initial cost of the set, as compared to 25% for replacement of comparable equipment in other forms of power conversion.

This is just one example of Chandeysson *performance* engineering. Behind every generator are decades of engineering and manufacturing know-how . . . consistent employment of only the finest, most durable materials . . . and user testimony to highest standards of performance and life-long service. For extra capacity to meet emergencies at the lowest possible cost . . . whatever your needs are in power conversion equipment . . . insist on Chandeysson low-voltage generators.

GET ALL THE FACTS on how you can gain lifetime power dividends with a Chandeysson Motor Generator set. Mail this coupon . . . Now!

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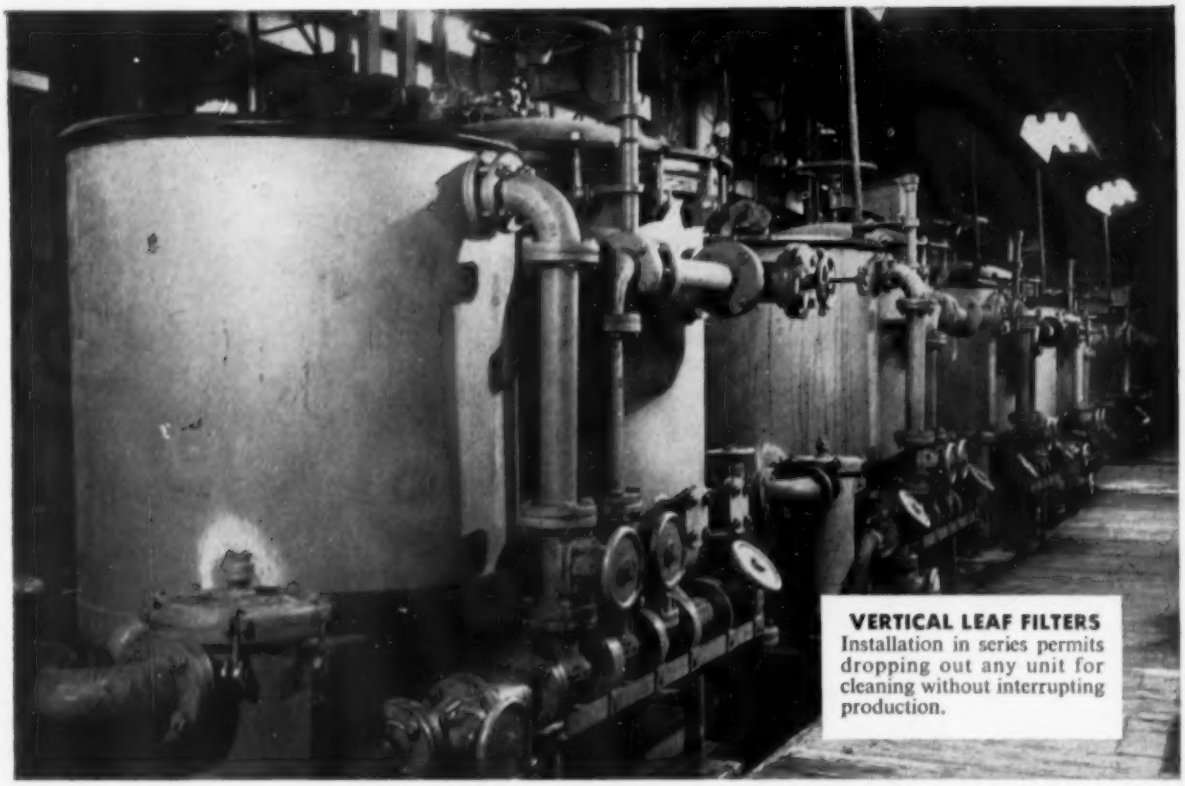

VERTICAL LEAF FILTERS
Installation in series permits dropping out any unit for cleaning without interrupting production.

Looking for better filtration?

Here are the important points to consider in specifying filters for your plating use

Form should follow function. No one filter design can work efficiently in every plating line. Rapid, thorough (and inexpensive) filtration can only be achieved by filters compatable with the process. Industrial maintains a staff of chemical engineers and chemists who work with you as a team to develop the most suitable form of the following vital factors.

Basic Design: Top, bottom or individual leaf outlets. Each has certain advantages, top outlets have a simplified lockup, controlled from outside the filter shell. Bottom outlets allow a smaller "heel" (fluid left in the chamber at end of filtering cycle) and have a "lift-out" system for attaching leaves to manifold. Individual leaf outlets permit using or shutting off any number of leaves.

Cleaning: Speed and simplified cake disposal keep downtime to a minimum. Industrial makes it possible to clean filters and handle filter cake in any way you wish.

The **air wash system** injects compressed air to agitate the rinse water, allowing repeated washings without opening the filter. **Sluicing devices** direct jets against the leaves for rapid removal of filter cake. **Mechanical shakers** rapidly recover dry material through large bottom outlets or clean-out doors.

Filter Leaf Spacing. This requires a neat balance between theory and practicality, especially where large cake volumes are concerned. The speed with which a filter handles a given volume depends on the leaf area and wide spacing offers a big cake buildup; however, space and cost can limit filter size and the thicker the filter cake, the more power needed to force filtrate through it. Industrial's accumulated data on flow rates for various volumes and viscosities can help decide this tricky problem.

Auxiliary Apparatus. Piping, tanks, pumps and controls should be considered as an integrated system and are best designed and supplied along with the filter. Industrial eliminates the exasperation of buying a unit only to find the piping or pump limits the entire process. One company responsibility is insurance for a fast start and smooth running operation.

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For full data ask for Bulletin 111

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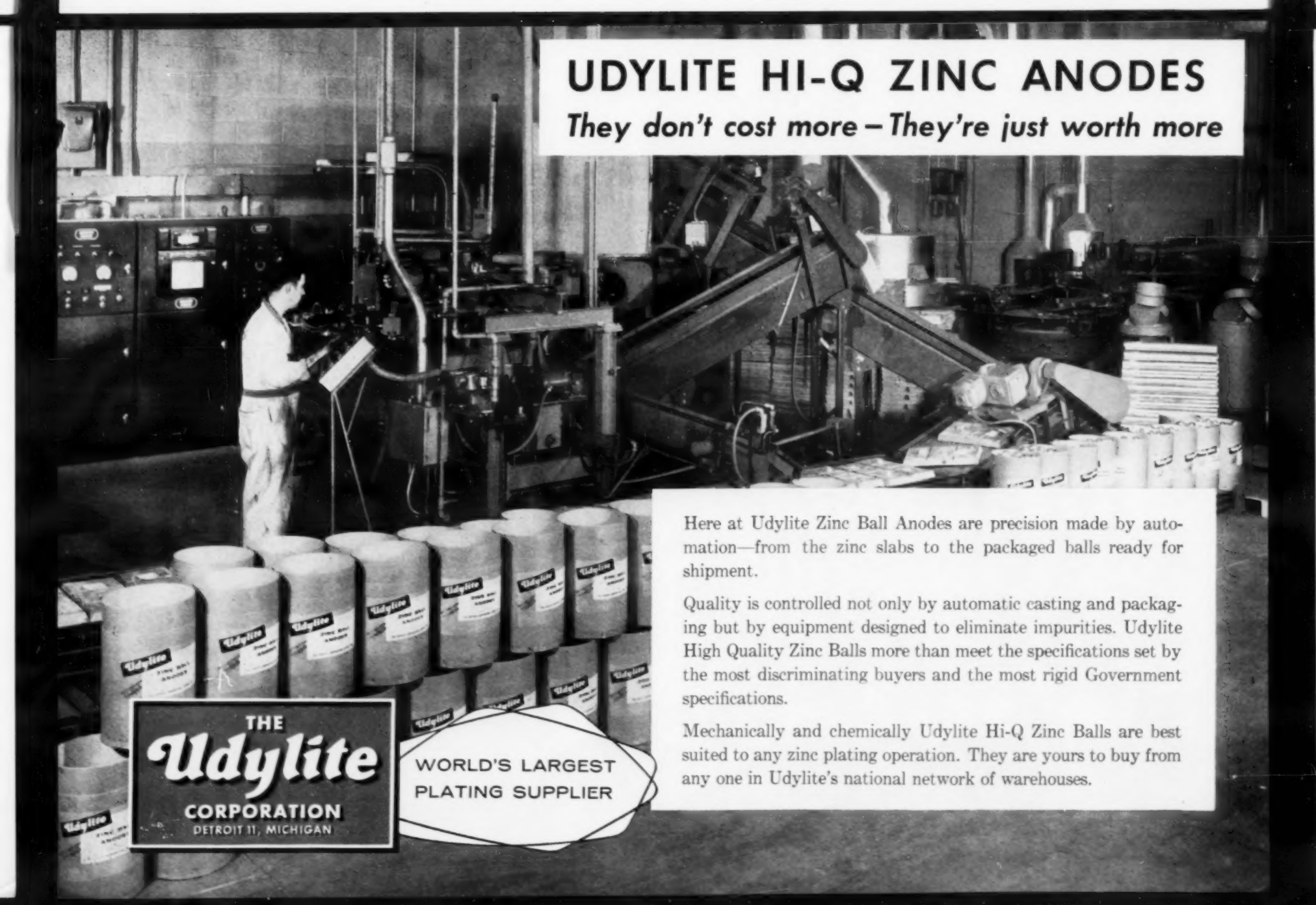
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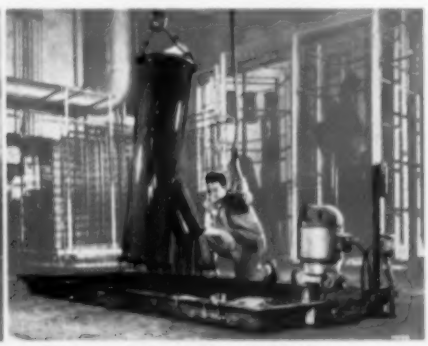

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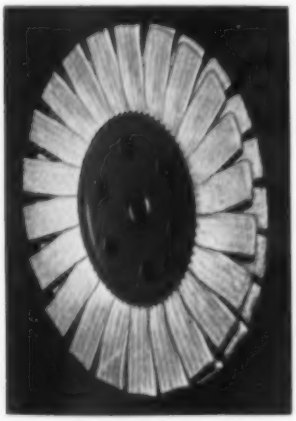

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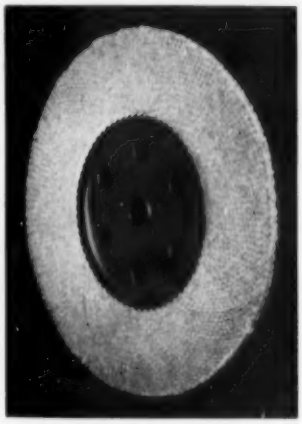

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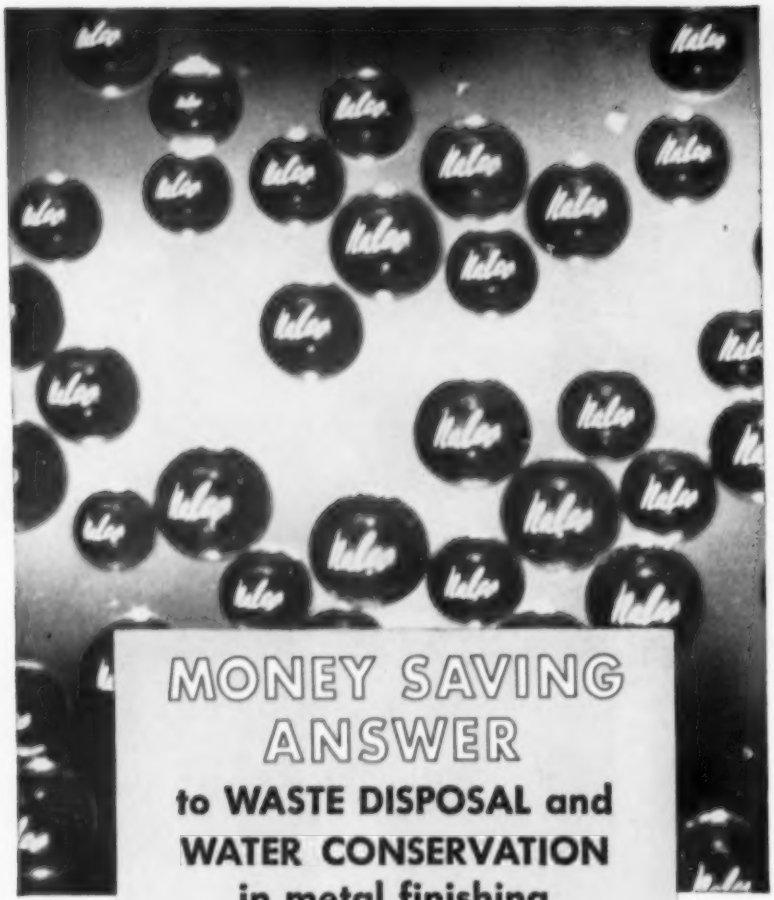

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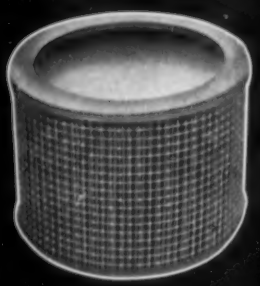

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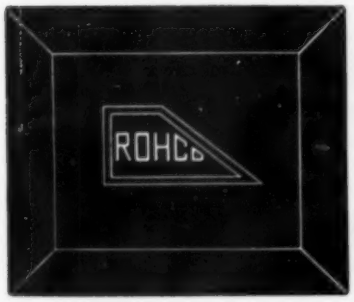

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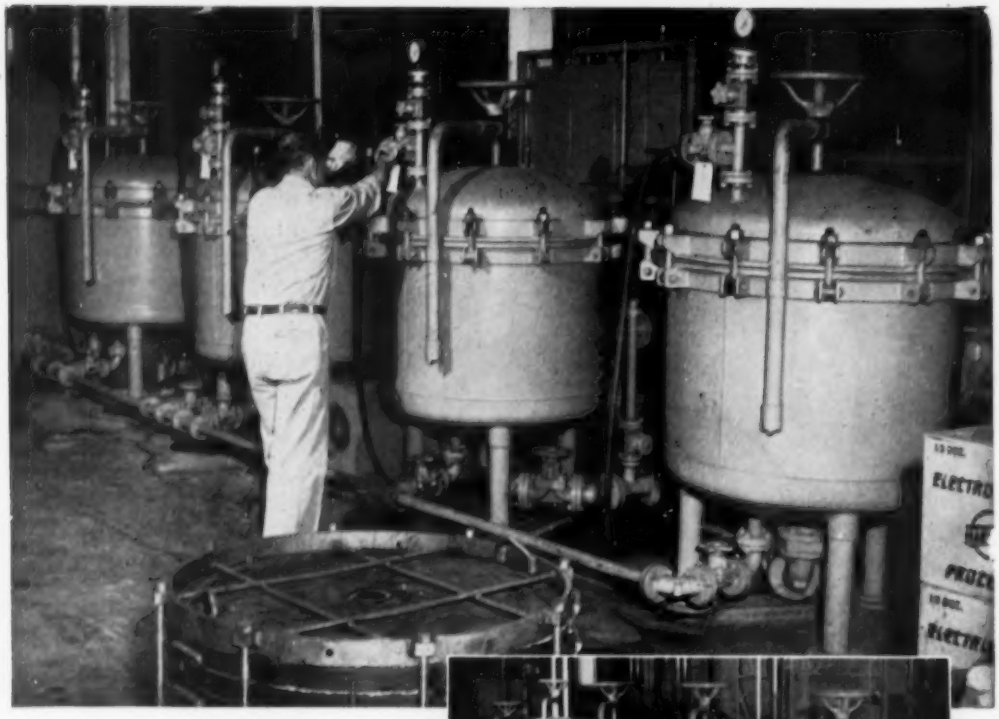

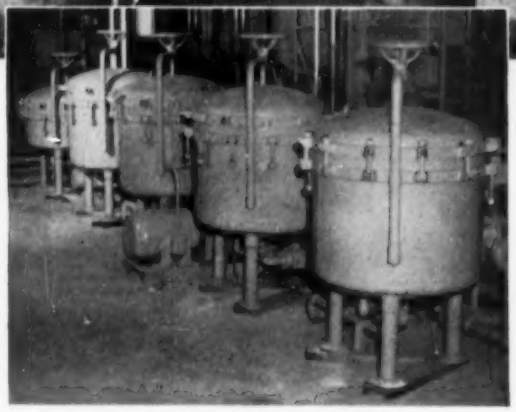

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Write Eric Andersen

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Surface Treatments of Low Alloy Steel by Sam Tour. WADC Technical Report 54-209, 203 pages, November, 1954, $5.00. Order direct from Office of Technical Services, U. S. Department of Commerce, Washington 25.

This report on metallic and organic coatings was prepared as a guide in the selection of surface treatments for protecting low alloy steels in engine and aircraft components. Although it has long been recognized that many such parts must resist oxidation at high or moderately high temperatures, the description in this report of some unusual conditions to which such parts are subjected may be new to many readers. For example, the environment might include the unusually corrosive products of combustion of fuels containing tetraethyl lead. Only very few coatings are satisfactory in this atmosphere.

Showing where nickel can be conserved by substituting low carbon steel with a protective coating for nickel bearing stainless steel, this report should be helpful to government and industry. The treatments that are considered in detail include aluminum claddings and other aluminum coatings, chromium diffusion coatings, electrodeposited coatings and paint films. Treating methods are described. The properties of the coatings and their effect on the properties of the basis metal are noted. Forming and joining characteristics are described. Yet applications and costs are treated too briefly for a report of this scope. Furthermore, some of the information on costs and particularly costs for chromium plating may be misleading.

In a chart of the suitable temperature ranges for various contings, electroplated nickel and chromium appear as being more limited in usefulness than they should be according to information on their serviceability in nuclear energy and other fields. This unfortunate discrepancy reflects a limitation in considering all the pertinent sources of information. (Only 91 literature references are cited in this 200 page publication and several of these are inappropriate.) On the other hand, the plating industry has not yet presented in convenient published form an accurate and comprehensive account of the role played by electroplated coatings in elevated temperature service. Such a task apparently was judged as being beyond the scope of this review on surface treatments for low alloy steels.

Although the review includes cadmium, zinc, paint and other coatings suitable only for very slightly elevated temperatures, lead and lead alloy coatings are neglected. On the other hand, the chapter on nickel coatings appears to be fairly complete. In addition to nickel and nickel-phosphorous alloy electroplates, the listings include nickel-tin and nickel-zinc diffusion coatings, electroless nickel deposits, coatings applied by the reduction of the carbonyl, and claddings. Aluminum coatings also are treated comprehensively, which is appropriate because they offer, in general, good protection against air oxidation at high temperatures.

Readers that are familiar with electroplating applications will recognize that electroplating is treated incompletely. Nevertheless, helpful and accurate information is presented in the chapters on the claddings and other coatings. The comparisons in the last chapter on resistance to corrosion, erosion and abrasion and on forming, joining and costs may be especially enlightening to many readers.

Reviewed by W. H. SAFRANEK

Symposium on pH Measurement. American Society of Testing Materials Special Technical Publication 190, 104 pages, Paper Cover, $2.50; AES members $2.25.

During the ten years which have elapsed since ASTM published the first Symposium on *p*H Measurement, significant developments in the field have occurred. To keep pace with these advances with *p*H instrumentation and technology, a second symposium was organized and published in this volume.

Among the topics covered are:

Meaning and Standardization of *p*H Measurements by R. G. Bates.

Performance Studies of Reference-Electrodes and Their Components at High-Temperatures and Pressures by J. E. Leonard.

Modern Developments in *p*H Instrumentation by W. R. Clark and G. A. Perley.

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Problems in Measurement of *p*H of Blood and Other Biological Fluids by Julius Sendroy Jr.

Quantitative Applications of *p*H Measurements in Analytical Chemistry by Henry Frieser.

Theoretical and Practical Problems in the Measurement of Acidity in Nonaqueous Media by Martin Kilpatrick.

Indicator Acidity Functions for Nonaqueous and Mixed Solvents by M. A. Paul and F. A. Long.

Covering such developments as nonaqueous solutions and refined methods of instrumentation, the symposium considers not only the advances in themselves but also the problems created by these developments.

The volume is well illustrated and contains several extensive bibliographies.

A Study of the Feasibility of Coating Magnesium with High-Purity Aluminum by C. F. Powell and I. E. Campbell, Battelle Memorial Institute for Wright Air Development Center, Nov. 1956. 28 pages, 75 cents. Order PB 121860 direct from OTS, U. S. Department of Commerce, Washington 25, D. C.

Vapor plating appears to be a feasible method of coating magnesium with corrosion-resistant aluminum, according to this report of Air Force-sponsored research.

Recent work with high-purity aluminum has shown it exceptionally promising as a protective coating for magnesium, which has been restricted in many applications by lack of suitable protection against corrosion. However, no satisfactory method existed for applying the coatings.

The feasibility of the vapor plating technique was investigated through a literature survey of aluminum compounds sufficiently unstable to be decomposed to yield aluminum metal at suitable plating temperatures. Most promising for further experimentation was pyrolysis of aluminum alkyls and of aluminum hydride and its derivatives at low pressures and at temperatures of 400 to 500 C.

MAIL BOX

DEAR SIR:

For your personal information I wish to make a comment regarding one point in an article that appeared in the March issue of PLATING. The article "Painting and the Plater," page 260, contains a paragraph reading: "The chemistry and physics of organic coating manufacture are very complex, and most successful formulations are finally achieved by 'trial and error' experimentation." The foregoing statement is correct in the broad sense that all development and research work, even the most scientific, involves an element of trial and error. It is incorrect in the sense that it conveys a misleading impression of the process by which modern paint laboratories formulate. In the paint industry there are many well organized, well staffed laboratories that outgrew the trial and error method two or three decades ago and develop formulas through carefully planned development or research programs. Every good paint laboratory has on its staff men with Masters degrees in chemistry and PhD degrees in chemistry. Men with a scientific training are not satisfied to work by trial and error experimentation.

WAYNE R. FULLER
Director of Research
Grand Rapids Varnish Corp.
Grand Rapids 2, Mich.

REPLY TO MR. FULLER:

I do indeed agree with Mr. Fuller that a great deal of science is applied in the formulation of organic coatings, and deeply regret that my wording would indicate that it was all done by "trial and error."

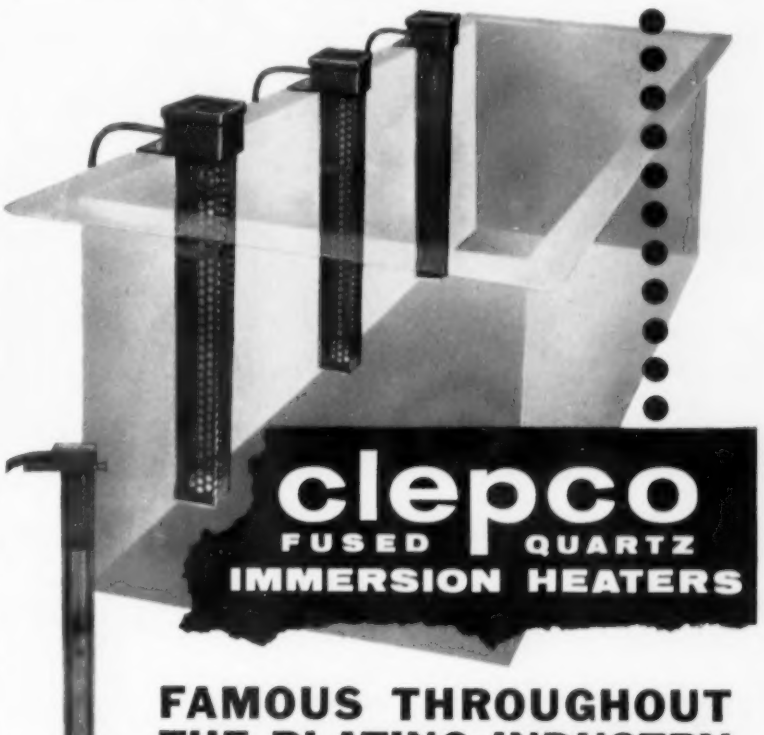
We all, of course, find our final answers to new problems by trial and error. We learn by education and experience which methods and materials are most likely to succeed, but the best final answers are decided by a process of elimination by trial.

It was to this phase of research and development to which I was making reference.

I do regret that I failed to put more emphasis on the many advances our organic coatings scientists have made in the past two or three decades, and the complexity of the field as it exists today.

MICHAEL BORUSHKO
Rampart Industries, Inc.
Detroit 12, Michigan

(*Continued on page 924*)



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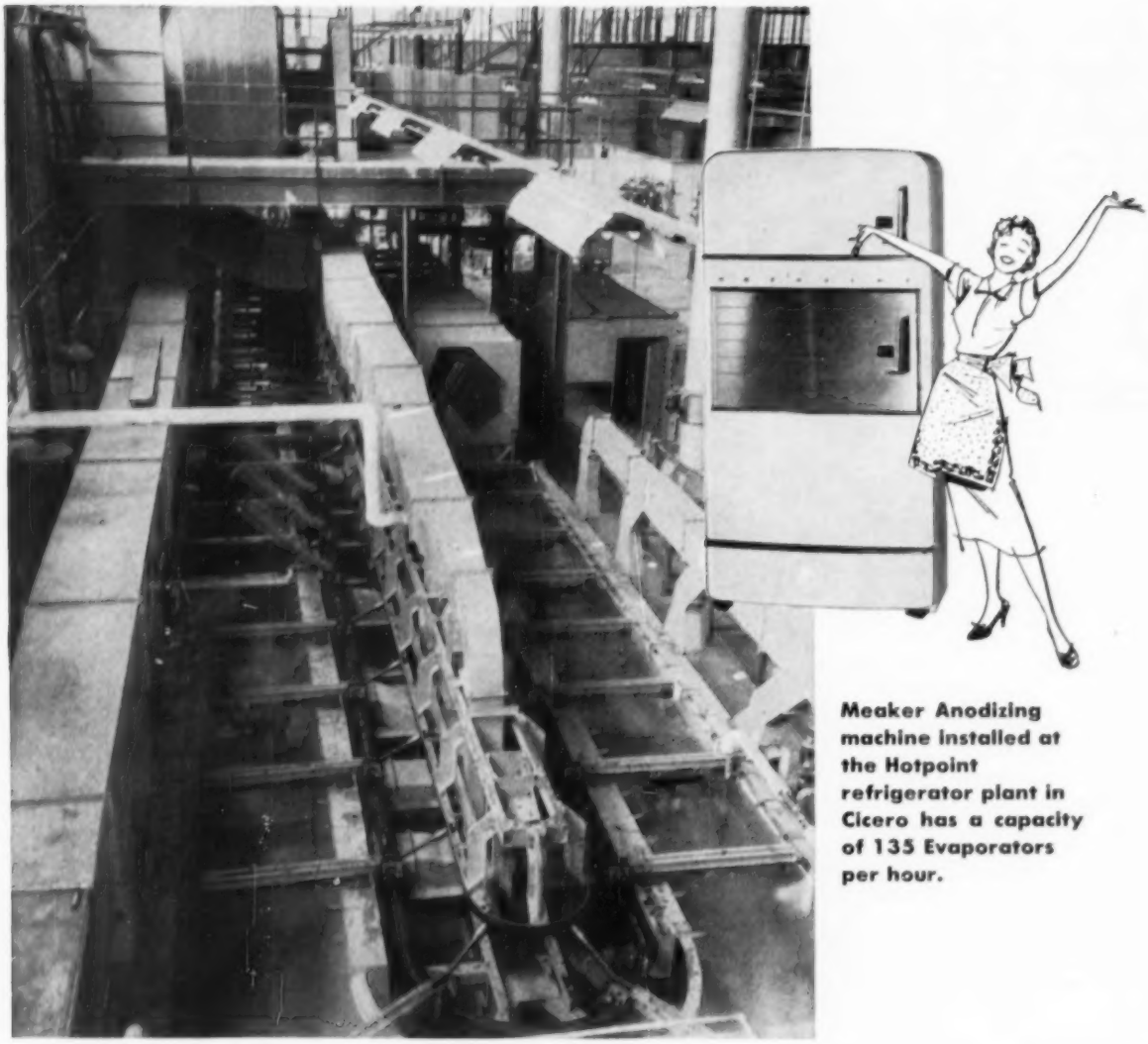

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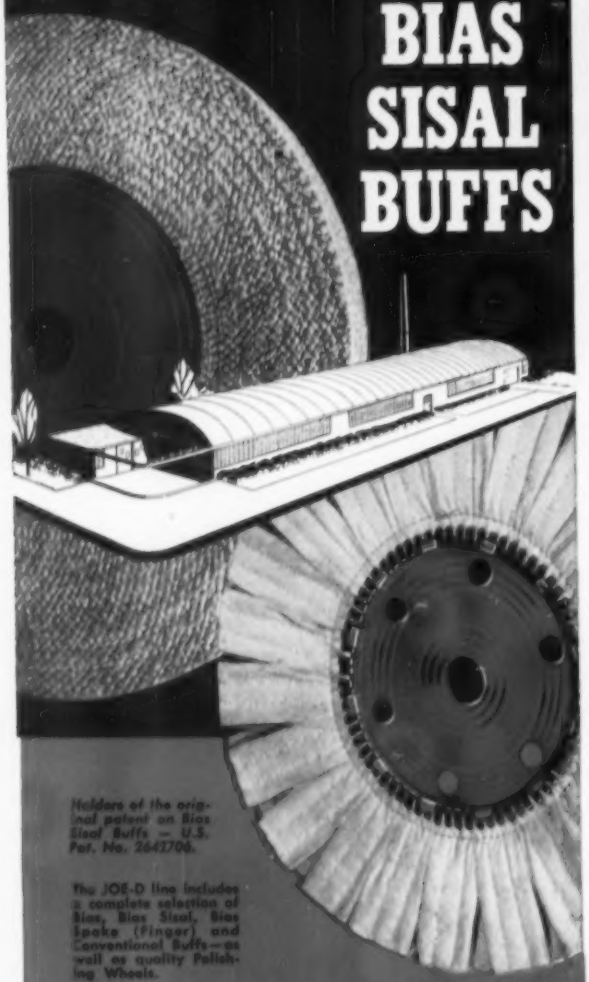

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- Designed specifically for vapor retardation.
- Cannot escape through filters or drains or hang up on equipment.
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- Engineered surface contours provide extensive interlocking and clustering.
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- Outstanding chemical and solvent resistance.

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Tank semi-opened, 100 sq. feet surface area, with 1½" layer of Mini-Vaps —

Conditions: Ambient, shop (70° — 85° F.)

Solvent: Dioxane

Evaporation savings per year using Mini-Vaps — $3,400.

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- Because no elevating mechanism operates above rack carrier unusually low headroom is needed.
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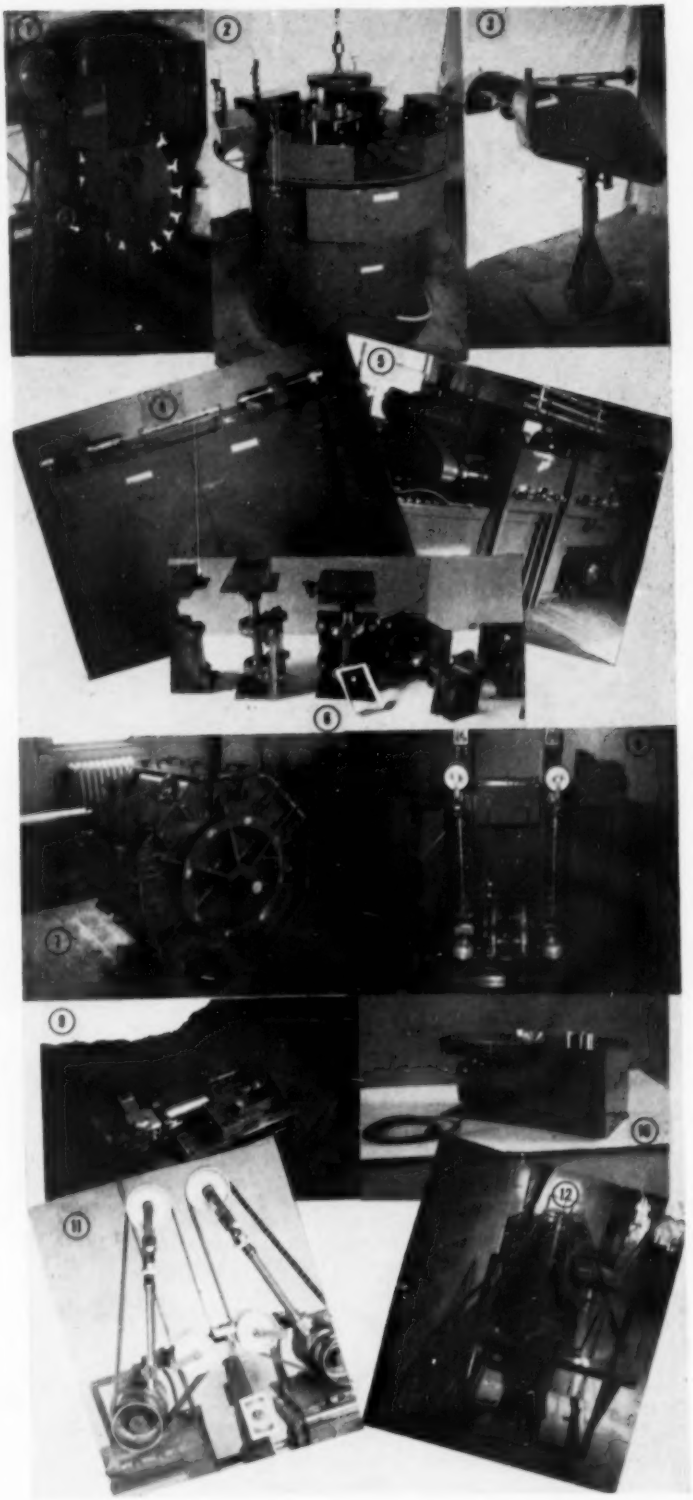
We have wide experience and "know how," and we will be happy to consult with you to help in solving your finishing problems.

We will rebuild your old polishing and buffing equipment to meet new production needs, and return it to you in "like new" condition.

We will engineer easily operated work-holding fixtures to fit your automatic operations.

Write us a letter or arrange to come to see us.

We will help you plan your whole finishing program, and will supply you with what you need to carry it through.



1—Ferris-wheel buffer
2—Indexing rotary
3—Special buffing head
4—Special drilling and tapping
5—Complete straight-line polisher
6—Work holding fixtures
7—Tumbling barrel
8—Automatic belt polisher
9—Oscillating fixture
10—Satin-finish machine
11—Ferris-wheel belt polisher
12—40' straight-line

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BULLETIN FAC-103

H-VW-M
FULL AUTOMATIC CONVEYORS

Presenting the story of growing automation in mass-production finishing . . . electroplating, anodizing, metal cleaning, phosphating, stress relief and pickling

H-VW-M

HANSON-VAN WINKLE-MUNNING COMPANY

MATAWAN, NEW JERSEY

PLANTS: Matawan, New Jersey • Grand Rapids, Michigan

SALES OFFICES: ANDERSON (IND.) • BALTIMORE • BELOIT (WISC.) • BOSTON • BRIDGEPORT • CHICAGO CLEVELAND • DAYTON • DETROIT • GRAND RAPIDS • LOS ANGELES • LOUISVILLE • MATAWAN • MILWAUKEE NEW YORK • PHILADELPHIA • PITTSBURGH • PLAINFIELD (N. J.) • ROCHESTER • ST. LOUIS • WALLINGFORD (CONN.) WEST SPRINGFIELD (MASS.) • UTICA

ADAPTABLE H-VW-M FULL AUTOMATIC CONVEYORS BRING

Automation

to every production application requiring automatic cycling of individual treatments through tanks . . . including:

ELECTROPLATING • ANODIZING • METAL CLEANING
PHOSPHATING • STRESS RELIEF • PICKLING

Today's increasingly automated metal-finishing places a real premium on the operational flexibility, broad application range, and engineered precision of all equipment used.

Recognizing this, H-VW-M design engineers have placed special emphasis on the development of equipment with features that permit fast, flexible, automated processes in metal finishing.

One such development is the H-VW-M Dial-A-Cycle system, which allows nine or more anodizing and plating operations to be carried out automatically, all under the control of one operator.

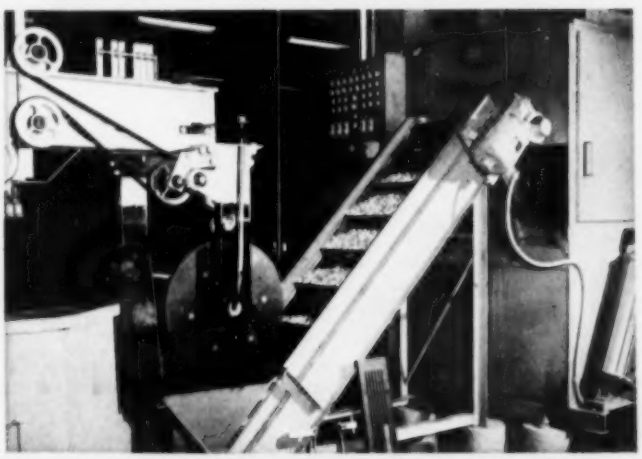
The pictures on these pages tell the story of the broad applicational scope of H-VW-M Full Automatic Conveyors. On page four are several illustrations showing how H-VW-M Dial-A-Cycle and Automatic Load-Unload have speeded up some large-scale plating and anodizing operations. These installations represent the way all H-VW-M equipment meets the requirements of modern industry.

H-VW-M equipment:

FLEXIBLE . . .

VERSATILE . . .

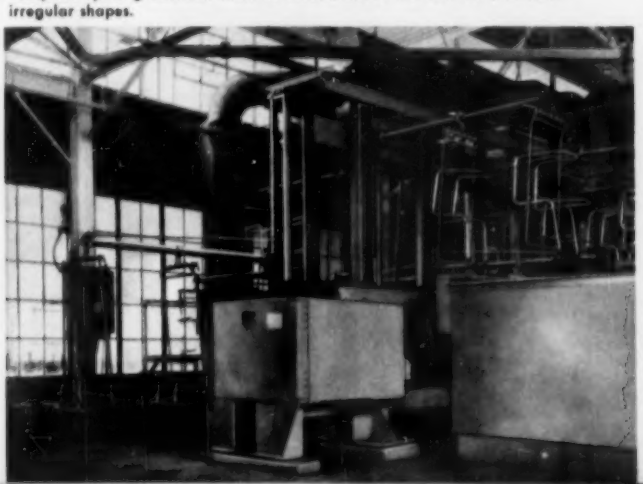
EFFICIENT . . .



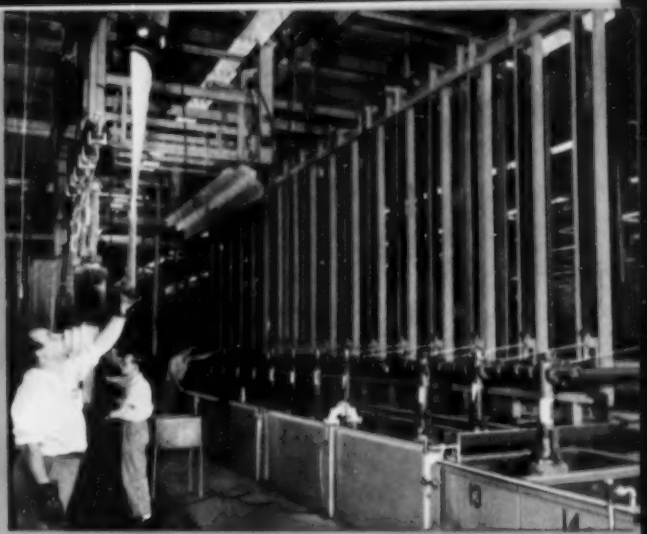
Automatic cadmium plating for small parts . . . screws, nuts and bolts . . . is done with this H-VW-M barrel plater, which turns out five tons of work an hour at maximum load. Barrel (at left) tilts, dumps finished parts into elevator to hopper dryer.

Anodizing goes automatic with this H-VW-M Dial-A-Cycle machine, installed at a leading refrigerator plant. The system has been used to control as many as nine different coloring, anodizing, plating or similar processes from one machine.

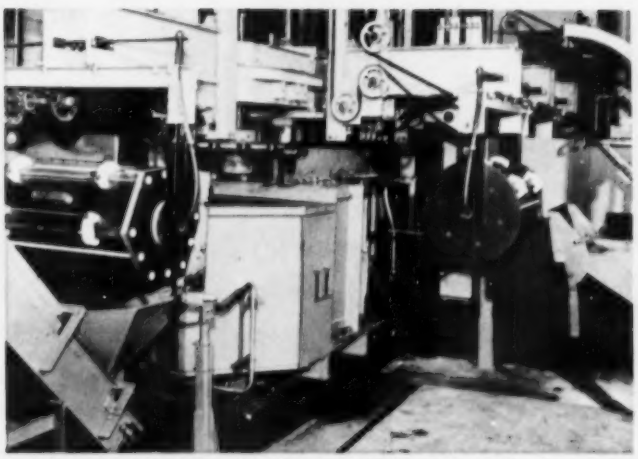
For bulky loads . . . this high-lift, full-automatic conveyor handles clumsy, tubular steel furniture frames with ease. Notice the long arms, with adequate spacing between them to accommodate the bulkiest and most irregular shapes.



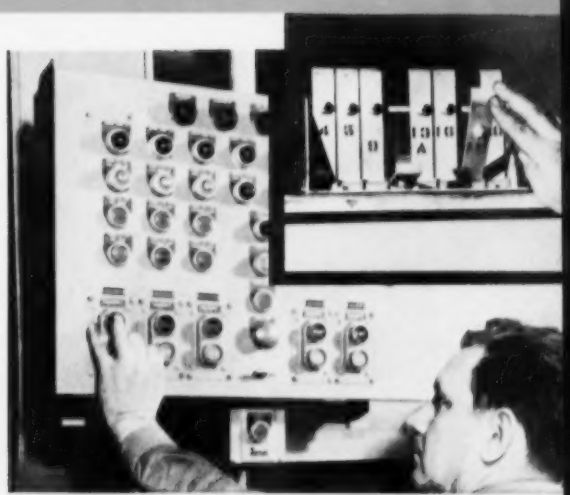
from the largest to the smallest . . . in processing die castings in the automotive industry, this full automatic plating conveyor takes 'em all. One machine like this has an operating solution capacity of 84,000 gallons—one of the world's largest for a single unit.



highest lift . . . for a return type conveyor, raising 300-lb. steel propeller blades a full ten feet during zinc plating cycle. To obtain correct blade balance and heavy zinc deposit, the blade transfers automatically to auxiliary conveyor chain for required recycling and automatic reload.

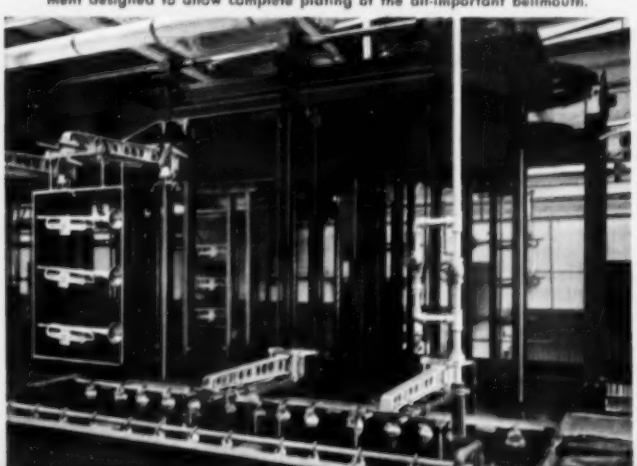


Compact arrangement of loading barrel (right) and unloading barrel (left) puts both within easy reach of operator. Raw parts come to machine in cans via roller conveyor, are dumped into storage hopper, then precision-portioned into weighing hopper for transfer to barrels.

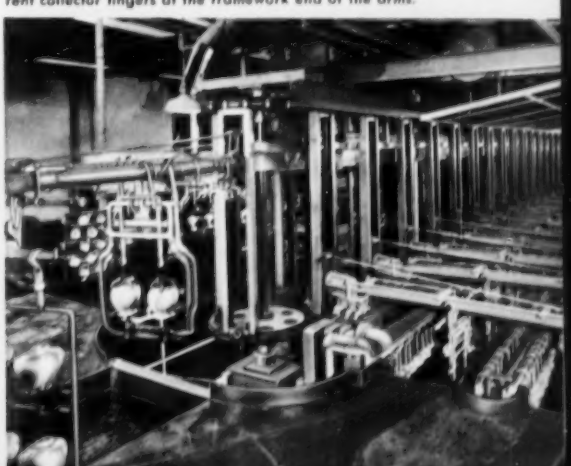


Push-button panel sets all power requirements for tanks. Course of the machine's 30 barrels is governed by setting these "flags" (inset) which will contact limit switches at various tanks to bypass certain functions.

Variable load capacity . . . is an essential when the same machine handles musical instruments of all shapes and sizes. Note the interior anode arrangement designed to allow complete plating of the all-important bellmouth.



Plating versatility . . . is the answer to the plating requirements of these attractive modern coffee makers. Like many other hollowware appliances, they are plated inside and outside by separate circuits. Notice the internal anode feature on the racks, and current collector fingers at the framework end of the arms.



DIAL-A-CYCLE

makes automatic metal-finishing more *flexible* than ever!

This dial is located on the carrier arm which moves parts through processing tanks. Simply by setting the dial, you predetermine the sequence of processing steps through which the work is to be moved. Automatic conveying does the rest, lowering parts into the correct series of tanks, and bypassing others, according to the dial setting.

The system operates by an arrangement of limit switches and solenoid-actuated setdown flippers. These control the selective action of the carrier. Different dial settings simply change the position of a "flag," which will pass or contact switches and flippers at each tank in the finishing sequence.

This anodizing machine uses new H-VW-M Dial-A-Cycle bypass mechanism. Operator sets dial at start of cycle. Carrier then automatically lowers parts into tanks, bypasses others by means of switches that contact dial at each tank.

AUTOMATIC LOAD-UNLOAD

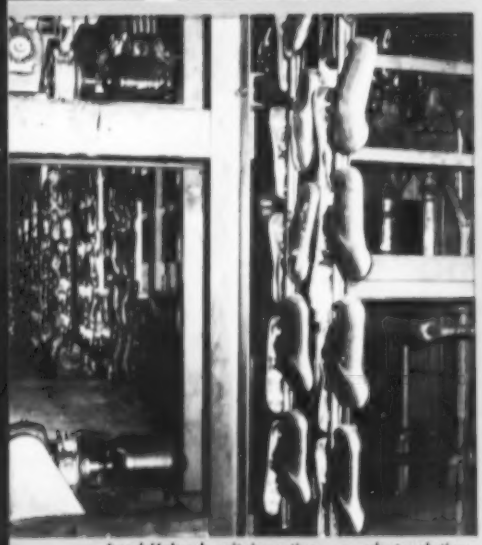
doubles production rate . . . one machine can do the work of *five!*

Serious bottlenecks caused by manual handling of heavy metal parts are completely eliminated when a processing conveyor is equipped with Automatic Load-Unload at transfer points. H-VW-M Automatic Load-Unload is a rugged, foolproof system that handles whole carrier racks of heavy parts—loading and unloading on the same indexing sequence as the electroplating conveyor. All controls are located in a centralized panel, permitting integrated automatic operation of elements in the finishing process.

One manufacturer of automotive parts reports almost a 50% jump in production per eight-hour shift since installation of H-VW-M Automatic Load-Unload. One set of finishing machinery is now doing the work previously done by five, and output per man has been boosted by more than *five times* the former rate.

Automatic Load-Unload permits greater production goals to be met with no overloading or loss of quality.

H-VW-M designs, manufactures and installs many other types of conveying equipment for metal finishing. We invite you to write for more information on the time and cost saving advantages of H-VW-M Full Automatic Conveyors and allied equipment.



Load-Unload unit in action . . . electroplating conveyor is in background. Loader has just removed two racks of plated auto bumper guards from the plating machine, and loaded two racks of raw work. Afterward, loader will shuttle in reverse, transfer plated parts to conveyor monorail, come back to deliver new load of raw parts to plating machine—all automatically.

IN-PROCESS FLEXIBILITY

With the H-VW-M equipment described on these pages, many in-process variations are easily made. You can—

- **Adjust the process**
- **Adjust conveyor parts**
- **Adjust the work**
- **Adjust the carriers**

—Right on the job!

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Printed in U. S. A.

WATER . . .

A GLOBAL PROBLEM FOR ELECTROPLATERS

by DAVID MILNE† and DR. D. GARDNER FOULKE‡

A good land, a land of brooks of water, of fountains and depths that spring out of valleys and hills— DEUT *8:7*

IN A REPORT MADE to the International Union of Pure and Applied Chemistry on a world survey covering the economic use of water and the effluent problem of the electroplating industry, the global importance of water to electroplaters was emphasized. The problem is universal, of course, because of the large amount of rinse water deemed necessary by the electroplating fraternity generally. The character of rinse water discharged in to the Ganges, the Irwell, the Ohio—or the Newark or Detroit sewer systems emptying into lower New York Bay and the ocean or Lake Erie, respectively—may be related one to the other, but certainly not to the water received by the plating shop.

The two prime water problems of the plating industry, supply and effluent, vary in magnitude primarily depending upon the industrialization of each country. Except for specific areas, for example, brackish water in the low countries and extremely little precipitation in the southwestern part of the United States, the problem of supply has not yet become an everyday problem to the plater. However, recent low precipitation years on the East Coast of the United States have made a number of platers, heretofore nonchalantly unaware that a supply problem could exist, conscious that water is our most valuable natural resource.[1, 10, 11] A study of population and industrial growth according to the report by the President's Materials Policy Commission indicates that use of water will skyrocket from the 185,000,000,000 *gallons per day* used in 1950 (43 per cent industrial) to 350,000,000,000 *gallons per day* in 1975 (62 per cent industrial).[12] In terms of city use it has been estimated that any city in the United States can expect in 1975, by virtue of increased population and increased rate of consumption, to be required to supply almost one and one-half times as much water in 1975.

Even now it is apparent that the supply and effluent problems are related. Uncontrolled rinsing and poorly engineered plating and metal finishing installations result in inordinate consumption and inexcusable contamination of water supplies. On the basis of the increase in water consumption, it is apparent that every responsible person in industry, particularly the electroplater for whom water is especially important, must consider water his particular problem and take steps to insure an adequate supply and to discharge an effluent compatible with the "best use" policy presently gaining acceptance in the United States.[3]

ACTION IN INDUSTRY

Certain areas are already stepping-up to the situation. In one small plant of the General Motors Corporation a drop in water consumption from a total of 1,337,000 gallons per month in 1955 to 786,000 gallons per month in

†Supervisor, Materials and Processes, Production Engineering Section, Process Development Staff, General Motors Corporation, Detroit, Michigan.

‡Manager, Electrochemical Development, Hanson-Van Winkle-Munning Company, Matawan, New Jersey.

1956 was achieved by careful re-engineering of the water supply to plating installations. The steps taken to achieve this reduction were as follows:

1. Installation of water meters on all equipment.
2. Use of the "counterflow" rinse principle.
3. Substitution of spray rinses for dip rinses wherever possible.
4. Incorporation of timers on spray rinses so that rinses operated only for a specific time interval.
5. Introduction of other plant wide conservation methods such as providing a recirculating system for cooling water for die casting machines.

At the General Electric Company's Electronics Park Plant, Syracuse, New York, water costs were cut more than $100,000 per year by observation of four general ways of stretching water supply:[5]

1. By designing water economy into the plant when it was built by use of evaporative condensers.
2. By providing refrigeration equipment for cooling water.
3. By making use of a spring located within the plant.
4. By instituting such water-saving steps as water shut-off valves on welders, installation of cooling towers, provision of water meters.

Iron Age for August 2, 1956 points out that Kaiser Steel Company was able to reduce water use in steel making to 1600 gallons per ton as compared to the national average of 65,000 gallons per ton by:

1. Recirculation of water.
2. Reuse of water in successive operations.
3. Using coolers in series.
4. Use of counterflow in pickling and cleaning.
5. Use of dry systems for air pollution control.

ORSANCO ACTIVITIES

An outstanding example of cooperation between industry and the control agencies is that of the Ohio River Valley Water Sanitation Commission. Following its establishment in 1948, the Commission approached industry in several fields with the proposal that several industrial committees be set up to act as advisory groups to the Commission. Response from industry was enthusiastic and several committees were organized, representing different industries in the Ohio Valley. Those of most importance to the plater are the Metal Finishing Industry Committee and the more recently formed Water Users Committee. The first group was concerned mainly with advising the plater as to how he could conserve on waste materials, how he could survey his plant to determine what and how much of his chemicals were being wasted, how he could analyze these wastes, and how he could treat them when recovery or waste prevention was no longer possible. Publications prepared by the committee on the above were extremely well received by the plating industry, and did much to lead the way toward conservation of materials, not only in the Ohio Valley but on a national scale.[9]

THE CURRENT APPROACH

Admittedly it is inevitable that water will become more expensive in the future, but the high costs quoted for conversion of sea water to fresh water by the methods now under study make it obvious that we are far from a practical answer. Until better and more economical methods are developed the current approach to the water problem will center around:

1. Economic use of water.
2. Control of effluent water.
3. Storage of run-off water.

All three methods are within the province of action by the plater.

Sound rules for the plater to follow with respect to the first two methods above are:[4]

1. Prevent the waste.
2. Recover what is being wasted for further use.
3. Substitute another process, discharging a less troublesome waste.
4. Treat wastes only after all other possibilities have been exhausted.

It is not enough to give token agreement to these rules by calling in the chemist to ask whether the necessary steps have been taken with respect to such a program. Even the small shop can take a leaf from the book of the large corporations which have been moving in the direction of "water management" with gratifying dollar and cents results—to say nothing of the bonus of improved public relations. Therefore, first make somebody responsible for setting up and carrying out an overall water program. This is the most important step in the whole program whether the plant is an old one or one being contemplated. In the latter case, the individual responsible for water management should be called on to help select the plant site with respect to the suitability of available water for the processes involved.

Failure to follow this apparently obvious step has resulted in considerable embarrassment and unnecessary expense following construction of plants in "water scarce" areas. To add to the difficulties, it frequently turns out that those areas which are scarce in water supply are also critical areas for the disposal of waste waters from industrial plants.

The water supply manager should, of course, recommend any necessary conditioning treatments to make the water more suitable for the particular job in mind in each plant. He should always be consulted in the process planning stage to make sure that any water intended for use in the process should be of suitable quality, recognizing that inferior quality of water can result in an inferior product.

ECONOMIC USE OF WATER

The economic use of water begins with the decision as to how to secure the lowest cost water for the most satisfactory job, thence to determination of minimum and maximum quantities needed, then to good housekeeping and conservation practices. When a water conservation program is started in a large plant, the first step is always the installation of water meters at all places where water is used. This coverage goes down to usage at individual machines, and for economy's sake is frequently conducted department by department, rather than over the entire plant at the same time. Although relatively inexpensive, these meter installations have frequently resulted in very appreciable savings by pinpointing locations of excessive water usage, or actual waste. It should be emphasized that in any such activity a system of recording, reporting, and finally, taking action on the results obtained must be installed if a satisfactory conservation program is to be established.

In the electroplating industry the conservation of water will concern itself primarily with rinse tank operation for it is there that the greatest consumption of water occurs. Water losses from processing tanks are minor, and usually confined to losses by drag-out.

Factors to be considered are:

Proper Rinse Tank Design: The rinse tank should be provided with a dam overflow at the entrance end and the water should not enter at the top of the tank. Best design calls for water entering under pressure from a manifold at the bottom of the entrance side, or near the middle for long tanks, and air at the bottom of the exit end to give good mixing and permit counterflow rinsing.

Reduce Drag-Out: Work should be drained for a sufficient time before rinsing, either over the plating tank or a separate dry reclaim tank. Install timed fog or spray rinse nozzles at exit of the plating tank, and over the plating tank itself so that the concentrated rinse drains back into the tank. This is particularly useful where plating tanks are operating at a high temperature. Place drip pans between tanks and set in such a way that the solution draining from the racks runs back into the tank from which the rack emerged.

Save rinses: The first rinse, immediately after the plating tank, is finding increasing use as a reclaim rinse. This is a non-flowing rinse which is pumped back into the plating solution with or without being concentrated. This system is particularly useful following heated plating baths.

Good Housekeeping and Design: Piping and auxiliary equipment leaks should be controlled. Free running hoses should be eliminated by means of spring actuated faucets at end of hose. Racks should be well designed and maintained and the work should be designed to drain satisfactorily.[9]

This is an area which is frequently overlooked by the plater under the misapprehension that he is not to be concerned with design problems. The stylist must, of course, have free reign in deciding how the part must look on the finished product. How that part should be made, however, is a problem which should be solved by the joint effort of the design engineer, the tool engineer, and the plater.

Aside from the extreme difficulty in plating certain contours produced by fabricating practices which do not consider plating difficulty, there is an additional area in which the plater can save money for his organization by advising on design which will help him rack the parts better and assure not only quality plating but satisfactory drainage of the parts being plated. This is a field into which too few platers have stepped in the past. The plater should realize that management is ready and willing to listen to any suggestion on his part which will help in producing a finished product which will stand up better in service, and be more economical to produce.

In addition to the simple engineering and good housekeeping procedures[6, 7] just mentioned, there are several more involved engineering steps which should be considered.

Rinse circulation: Rinse water can be circulated through a treatment cycle greatly reducing rinse water consumption, e.g., cyanide rinses may be chlorinated,[8] or metal-containing rinses treated by ion exchange, and the rinse water returned to the process.

Multiple Rinses: Multiple series rinses should be used where possible. A three-stage rinse can reduce water consumption very greatly. Where recovery of water and chemicals is planned, use multiple counter current rinsing whereby the third rinse tank flows into the second, and the second into the first which is then treated by ion exchange or evaporation and the purified water returned to the third rinse. A practice which seems to be finding increased acceptance in the industry is to control the amount of rinse water flowing to the tank by determining conductivity of the rinse water leaving the tank. When plating solution rinsed off the part rises to a certain concentration in the rinse tank, then the conductivity cell in the effluent line causes the water supply valve to open, thus adding more fresh rinse water.

Wastes Segregation: This matter properly comes under the second of the solutions proposed earlier: "Control of Effluent Water." However, in many instances the segregation of wastes has made it possible to treat part of the waste water by multistage evaporation, or by ion exchange, and return to the rinsing tanks or even to the processing tanks to be reused.

Leak Control: Every step possible should be taken to detect leaks from plating tanks and auxiliary equipment. In some installations, this is accomplished partially by elevating the tanks above the floor level so that leaks from the bottom of the tanks may be observed readily. In most modern plating plants, provision is now made to place walls or curbs around the plating systems so that accidental losses or leaks from the tanks, or from equipment, will be retained within the curbed area. This curbed area may be drained to emergency storage tanks but should

never have drains which are connected directly to sewer systems. In considering leakage, one should be aware of that fact that leaks can occur into tanks as well as out of tanks. Cooling coils may be a source of unexpected leakage and heating coils may provide an unsuspected means of removing concentrated plating solutions from the tank.

Heat Exchangers: The amount of cooling water circulated through heat exchangers should be maintained at a minimum by periodic cleaning of the heat exchanger, or by the use of chemical water conditioning in a circulating cooling system in conjunction with heat exchanger operation. Insofar as possible, water used as a cooling medium through heat exchangers should be conserved for either reuse as a cooling medium, or as rinse water in other portions of the plating system. Here again the heat exchanger might be a source of leakage of solution, either into the plating system or out of the plating system, depending on the cooling water pressure.

Steam Condensate: Steam condensate recovered from heating operations in connection with plating systems should always be considered as a source of pure water for solution makeup and rinsing. In many cases it will be found, however, that contamination of steam which has been used for driving air compressors will make the water unfit for use due to the oil content. In other cases, particularly in older installations in which the boilers are being operated considerably beyond capacity, it will be found that boiler water carry-over will introduce some unexpected chemicals to the condensate. These, of course, should be evaluated as to whether or not they will have a detrimental effect on the system.

CONTROL OF EFFLUENT WATER

Whether waste water is to be recovered for reuse or to be subsequently treated, the segregation of wastes and the application of good housekeeping measures will reduce the volume to be treated and simplify the treatment. Methods for accomplishing this have been described elsewhere.[8, 9] Direct acid and alkaline wastes to the most advantageous place of exit to make use of neutralizing capacities, keeping in mind complications such as Cr^{+++} oxidation to Cr^{6+} by chlorine for cyanide treatment, for example.[7]

In many instances recovery of contaminants is not economical and, if sufficient dilution is impossible, destruction is practiced. The procedures used are now rather standard and the following are used throughout the world unless a special condition exists—as, for example, a plentiful supply of steel pickle waste in-plant or near by which may be used to reduce chromic acid.

a. *Acid wastes:* If these cannot be neutralized sufficiently by concomitant alkaline wastes, they are normally directed to a final holding sump where a lime treatment is employed. Metallic hydroxide sludges are removed as required.

b. *Hexavalent Chromium:* (Chromates or Chromic Acid) Chromic acid is generally reduced to the chromic ion which is then precipitated in a final lime treatment tank.

Reducing agents commonly used are sulfur dioxide, soluble sulfite, or ferrous sulfate. The latter adds to the sludge removal problem, of course. Unless a plant has a plentiful supply of waste ferrous sulfate in pickled liquor, it usually resorts to the use of one of the soluble sodium sulfites, or to metered sulfur dioxide at *p*H value of 2 to 3.

c. *Cyanides:* Here, as for chromates, a number of methods have been proposed. However, oxidation by alkaline hypochlorite is the generally accepted procedure. This oxidation may be carried to cyanate or to CO_2 and N_2 depending upon the requirements.

In one closed system, the *p*H is reduced to 5.0 and chlorine is injected, then the *p*H is raised to about 11.5 and another chlorine injection made at which time the *p*H drops to about 10. At that *p*H all cyanogen chloride and cyanate are oxidized to nitrogen and carbon dioxide. In batch operation the *p*H is usually raised above 10 and chlorine added if cyanates can be tolerated. If not, the *p*H is adjusted to 8.5 and at least an hour's reaction time with a 10 per cent excess of oxidant is provided.

Some plants prefer to use a rinse water treatment system in which the treatment agent is added to the rinse water in the process. This is accomplished by removing a percentage of the rinse water continuously, passing through equipment which proportions the treatment chemical into the rinse water, and return of the treated rinse to the rinse tank.[4] Buildup of salts in such a system is controlled by a continuous but proportionately small overflow of rinse water from the tank.

Maintenance of excess chlorine in rinse waters following a zinc cyanide plating system has been found to have no deleterious effect on the quality of zinc plate produced in the process.

STORAGE OF RUN-OFF WATER

Ponding of water can make for water savings and is particularly applicable where large amounts of cooling water are involved. Cooling is effected by spraying or by cooling towers. One corporation[12] has found this practice yields water at 3.6 cents/1000 gallons versus well water at 3.7 cents/1000 gallons and city water at 13 to 26 cents/1000 gallons.

The spread between public and well water costs will cause many to take another look at receding water tables and perhaps determine that something should be done to control the wild run-off of water from the point of precipitation to the sea.

One area which would be well worthwhile for the plater to consider is in the recharging of subsurface water supplies by relatively pure waters wasted from his operations. With the cooperation and approval of state authorities, recharging of water strata is being carried out in many parts of this country. This inevitably helps to maintain the water table and to assure an extension of water usage for many years to come. It should be emphasized again that this step should only be taken with the complete approval of the state health and water resources authorities. This applies even to the use of ponds for disposal of

effluent or leaching pits in which plant effluents are discharged in the expectation that they will sink into the ground. Ill advised attempts at this have resulted in serious contamination of neighboring well water supplies.

The collection of run-off water can only be done by large corporations—and it *is* done, incidentally—or by public action. Considering the vast quantities of water now falling and running off to the seas without serving society to the fullest advantage, it is apparent that reservoir storage should be one of the most important matters facing industry today. The plater by virtue of his very real need for considerable water should support public programs dedicated to this objective. This might well be done on an organized basis—else the plater will again find himself outside looking in, reminding us once again of the nickel situation which is not yet history for most of us.

Industry in general is recognizing the importance of long term water planning. Each individual plater must become aware of the fact that water is our greatest natural resource and take steps to keep our land a good land "a land of brooks of water, of fountains and depths that spring out of valleys and hills."

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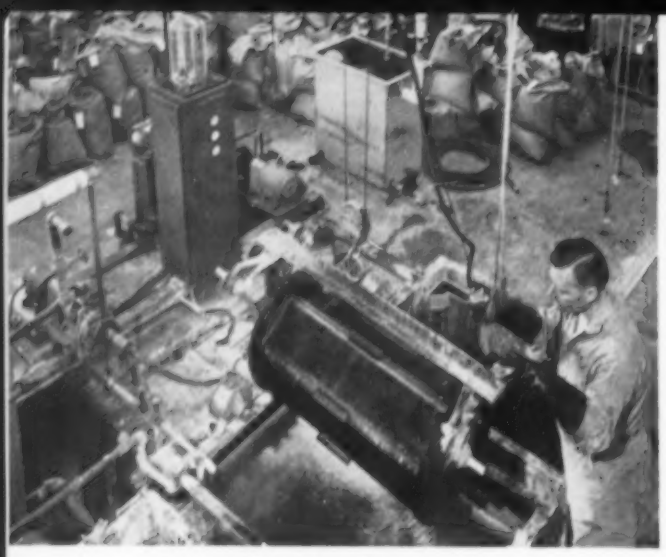
Mr. Milne entered the United States Army in December 1943, and his service assignments were in the field of engineering. He was separated in March 1946 with the rank of Captain. He is a member of the National Society for Professional Engineers and the Engineering Society of Detroit, and is a registered professional chemical engineer in the State of Michigan.

Mr. Milne has had papers published on chemical engineering subjects, principally in the field of industrial waste control.



The work is prepared for plating in the cleaning tanks shown in the foreground.

CYANIDE WASTE— Oxidized in the Plating Room

by **E. A. HILL**† and **F. J. NEFF**‡

A RECENT SURVEY recorded 12,513 "firms operating electroplating and/or allied finishing departments in the United States." Undoubtedly, a fair percentage of these firms, due to geographical location or the finishing process itself, are not faced with the problem of treating waste water. Firms that are treating waste water have treatment plants which, if classified according to location, will generally fall into one of the following groups:

A. The external plant where separate facilities are provided remote from the plating room for housing treatment tanks, chemicals and control equipment.

B. The internal plant where space is allocated in the plating area itself, to accommodate treatment facilities.

The location of a treatment plant normally will be influenced by one or more of the following factors: (1) waste flow rate and concentration, (2) the number of operations required to render the waste acceptable for discharge, (3) the type of treatment scheme employed, and (4) the general distribution of waste sources throughout the plant.

An internal plant designed to oxidize cyanides, a toxic constituent frequently found in plating waste, has been chosen for discussion. In case history fashion the factors which influenced its choice, the setting-up of the plant and its operation will be described.

Manufacturing and Finishing Facilities

The small company whose treatment methods are being used as the example found it necessary to increase its manufacturing space and facilities and decided to build a completely new plant. This choice was a move from a relatively crowded city zone to a more pleasant outlying area. The change placed the plant under a different sewage disposal authority and all of the new plant waste went to it.

Due to the use of bacterial methods of sewage disposal which can be destroyed by toxic materials, the sewage handling plant set definite limitations as to their maximum concentration in the company's waste. For cyanides as CN, the limit is 2 ppm. It was this that made necessary the need of special treatment equipment for destruction or removal of cyanides, as the major finish applied on the product is cadmium electroplate.

The manufactured product, a large variety of steel stampings made of thin steel and of varied shapes, have a very large area and together with "cupping" produce high dragout. Since the product is handled through most of the cleaning and plating cycle in a plating barrel, the dragout problem was of primary concern. It is realized that this is the sole source of the cyanide waste.

Through the complete cycle of plating operations the barrel is turning and tumbling the parts continuously in each tank. The cleaning is performed in the barrel by the action of an alkaline descaling electrocleaning type bath. Because this contains some cyanide, it is followed by a wet dragout rinse in order to make some recovery of solution. The plating operation contains the greater amount of cyanide and is also the more difficult to recover since the barrel and parts are wet following the cleaning rinse. A dry tumble preceding plating to knock off most of the water is used to reduce the drag-in so that recovered solution can be reused. A heated dry dragout recovery tank such that the barrel does not touch the solution follows plating. A wet one contains too high a volume of

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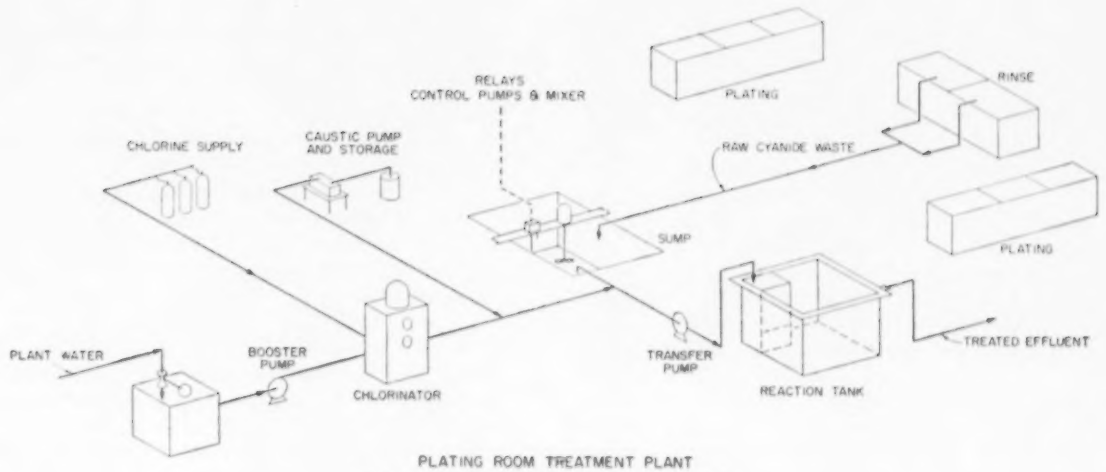


PLATING ROOM TREATMENT PLANT
FLOW THRU TREATMENT OF CYANIDE RINSE WASTE
MANUAL CONTROL - START STOP OPERATION

FIG. 1

too dilute a solution to be used efficiently. The rinsing cycle is a single tank, plus a thorough centrifugal wash followed by drying in the same operation.

All water used for rinsing purposes following cleaning or plating is directed to a common sump for treatment. The tank rinses are continuously flowing and the centrifuge rinse is intermittent, once for each barrel load of parts. Multiple rinses were not a necessary part of the final cycle and therefore reduced the amount of handling required with only a slight increase in the total amount of water used.

Determining The Waste Load

The initial step in planning for plating waste treatment is to determine ahead of time, as accurately as possible, the anticipated waste load in regard to flow, concentration, and the constituents which must be removed, destroyed, or neutralized to render the waste acceptable for discharge. The waste load is directly established for existing plants when proper sampling, analysis, and flow measurement of waste water is made. A practical check of the "analyzed waste load" may be made by comparison with inventories of chemicals used in the plating operation, some of which may in whole or in part find their way into waste water.

Predicting the waste load for a new plating room is by necessity indirect. It is usually established by obtaining the information from others engaged in similar plating operations, the plating equipment supplier if possible, or by using empirical relationships in which drag-out is based on a per cent of the plating tank volume or volume of plating solution per square foot plated.

The waste load for the new plating room under discussion was based on the company's previous experience from similar plating operations at another location. It was determined that the treatment plant should be designed to handle a waste flow of 1200 gal/hr containing 150 ppm cyanide as CN. Actual operation of the treatment plant has borne out the original estimate.

Method of Treatment

Based on a survey of known methods of cyanide treatment, alkaline chlorination was chosen and accepted. It was required that the cyanide be oxidized to cyanate before discharge to the city sewer system.

Various schemes were considered for applying the alkaline chlorination method. Batch treatment, in which the waste is collected and treated alternately in two eight-hour tanks, was ruled out due to the floor space requirement. Approximately 500 sq ft would have been required for tanks and control equipment.

The closed recirculated rinse treatment, requiring a relatively small floor space, was considered. When this system is used, the treatment chemicals are added continuously to the rinse water which is recirculated between the plating rinse tank and an external holding tank. The prolonged contact time and continuous chemical addition promote total oxidation of the cyanide. Since partial oxidation or treatment to cyanate was sufficient to meet the requirements, the recirculated rinse treatment, although offering other advantages, was ruled out in this case on the basis of increased chemical usage. The chemical requirements for total oxidation of cyanide is approximately double that required for oxidation to cyanate.

The third treatment scheme considered, and the one that was adopted as best fulfilling the requirements, is shown diagramatically in Fig. 1. The system provides for flow-through treatment of cyanide to cyanate on a start-stop basis. The factors which influenced the choice of the treatment plant and its component parts were as follows:

A. Space Requirements

The flow-through treatment takes up 120 sq ft of

plating room floor area. This area requirement was small enough to permit treatment in the plating room, thus avoiding construction of external facilities.

B. Operating Personnel

No addition to plant personnel was required for operating the flow-through system. Routine testing of the system, replenishing treatment chemicals, and maintenance of the equipment are performed by the plating room and maintenance personnel, under direction of the production manager.

C. Treatment Chemicals

Chlorine gas used in conjunction with liquid sodium hydroxide, prepared hypochlorite solution and dry hypochlorite granules, or tablets, are the three commercially available sources of "available" chlorine generally used in alkaline chlorination. Chlorine gas and sodium hydroxide were chosen as the treatment chemicals, thus keeping operating expense at a minimum. Based on prevailing prices in the plant's locality the cost of one pound of available chlorine is as follows:*

Hypochlorite Tablets—49 cents per lb available chlorine. Hypochlorite Granules—44 cents per lb available chlorine. Hypochlorite Solution—37 cents per lb available chlorine. Chlorine gas and sodium hydroxide—18 cents per lb available chlorine.†

During the first 10 months of the treatment plant's operation over 10,000 pounds of chlorine gas (same as "available" chlorine) have been used. The savings realized during this period by using chlorine gas versus the next cheapest source of chlorine have paid back the initial investment in feeding equipment.

*Prices as of June 1957, rounded off to the nearest cent.
†Includes cost of 1.2 lbs sodium hydroxide (dry weight).

D. Flexibility

Plating room additions were anticipated in the initial design. The reaction tank was compartmented for sampling and feeding equipment specified so that the system could be adopted to automatic control to effectively handle an increased waste load without rendering obsolete any major components.

The Treatment Plant

The cyanide waste originates at two rinse operations following plating. The first is a dip rinse with continuous flow; the second a centrifugal rinse where flow is intermittent. Both rinses are manifolded to a common drain which empties into a holding sump in the plating room floor. The sump is approximately of 300 gallons in capacity providing 15 minutes holding for equalizing waste flow and concentration. The contents of the sump are transferred by a centrifugal pump through standard steel pipe to the inlet compartment at the top of the reaction tank.

The reaction tank is 800 gallons providing a theoretical 30 minutes contact time for treatment. Cyanide can be oxidized to cyanate between a *p*H of 9 and 10 in the presence of a chlorine residual in 10 minutes or less. The reaction tank is steel plate welded construction, with angle iron supports. It has a sloped bottom with a clean-out port on one side for occasional sludge removal.

An outside water source is used for applying the chlorine gas-sodium hydroxide mixture. Plant water is pumped

General view. The barrel is removed following plating (background). Waste treatment feeding equipment settings are recorded (foreground).

at a rate of 3 gpm from a small suction chamber with a float operated makeup, through the chlorinator and discharges into the transfer pump section. Fifty per cent sodium hydroxide is added by a diaphragm type proportioning pump at the discharge side of the chlorinator.

Operation of all the mechanical equipment is on a start/stop basis, actuated from a high/low electrode system in the collecting sump. At high level the transfer pump, a mixer in the sump, the pump supplying the chlorinator and the caustic feed pump all start simultaneously. When the low level is reached, all equipment shuts down.

Operation of the Treatment Plant

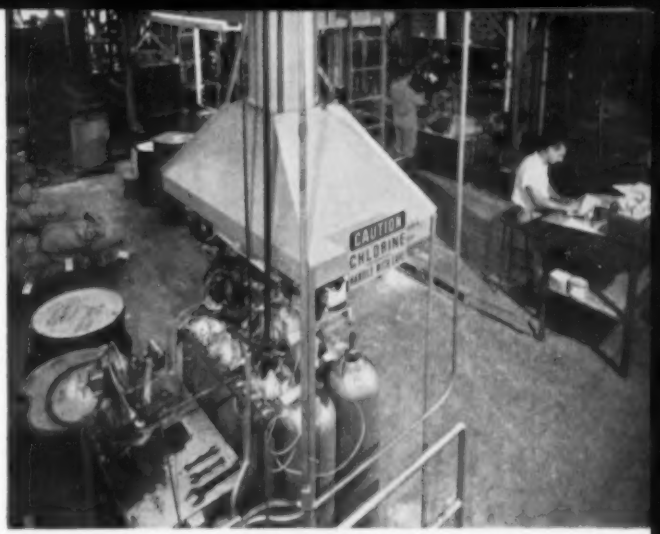
The foregoing discussion and Fig. I describe the final arrangement of the treatment plant including modifications made during the first year's operation. Although the system is fairly simple and straightforward, it was not without the typical operational "bugs" that have to be worked out, as in all new installations, before settling down to routine operations.

Water Hardness

The chlorine booster and transfer pump delivery rates showed a sharp decrease after a short period of operation. The pumps were taken down. A hardness scale build-up in the pump casings and impellers was found to be the cause.

The plating plant takes its water from a well supply. The water hardness runs as high as 27 grains (462 ppm). High *p*H conditions favoring the precipitation of the hardness are inadvertently set up in the treatment plant and in the rinse operation. Caustic addition was originally made on the suction side of the chlorine booster, accounting for the scale buildup at this point. The booster is a turbine-type pump. Conditions favoring hardness buildup in the pump were eliminated by merely moving the point of caustic addition from the suction side of the pump to the downstream side of the chlorinator injector. This change in sequence of chemical addition was possible because plant water is used to operate the chlorinator.

Scale formation in the transfer pump submitted to a similar solution. In this case hardness is precipitated by the combination of the rinse water and the highly alkaline cyanide drag-out from plating. The precipitate is received at the collecting sump in the rinse waste stream. It was found that when the chlorine-sodium hydroxide solution was added to the suction of the transfer pump instead of the discharge side, where it was originally, the scale formation was considerably reduced. This change in the point of application of the treatment chemicals eliminated clogging of the all-iron centrifugal transfer pump. It was soon noted, however, that the pump was undergoing severe chemical corrosion. The final solution was to leave the point of application of the treatment chemicals on the suction side of the pump, to obtain the cleaning action and the replacement of the all-iron pump with a high-alloy stainless steel pump, resistant to chemical corrosion. It is believed the initial low *p*H of the treatment chemicals applied to the pump suction accounts for keeping the pump clean.



Chemical storage area. Fifty per cent caustic is pumped directly from the shipping container (left). Chlorine gas is withdrawn from 150-lb cylinder (center).

Materials of Construction

All piping for waste transfer and feed lines are steel with the exception of rubber hose that runs from the chlorinator to the point of application. Plastic polyvinyl chloride fittings are used at two junction points; the tee where sodium hydroxide is injected into the chlorine solution and the point of application of the chemical solution in the waste transfer line.

Control

The chlorine and sodium hydroxide feeders are manually pre-set to feed at a fixed rate. Chemical addition and waste transfer occur simultaneously as mentioned above. Variation in the waste load being treated can be influenced by the two factors: flow and concentration. Flow in this case

Chlorine cylinders are manifolded to the gas supply line. Alarm switch in gas line (gauge) and caustic feeder are shown in right foreground.

Waste treatment area. Collecting sump is covered by a grating (center foreground). From right to left are the plant water suction chamber, booster pump, chlorinator, transfer pump and reaction tank (behind girders).

is fixed by using the simple arrangement of a centrifugal pump discharging against a constant head. Variations in waste concentration are equalized in the agitated collecting sump. The sump will hold the flow from the continuous rinse through a complete rinse cycle. Flow from the centrifugal rinse occurs approximately every fifteen minutes. It is less concentrated than the continuous rinse. When the centrifugal rinse discharges, it therefore reduces the combined concentration for a short interval every 15 minutes. Testing of the system has indicated that there is a three to five per cent chemical excess during this interval. The base feed rates are set to handle the maximum concentration from the continuous rinse.

During the initial operating period, chlorine residual checks and *p*H readings were made and recorded on a "score board" hung by the side of the treatment tank. A caustic to chlorine ratio of 1.2 to 1, based on feed rate settings, has been found satisfactory for maintaining the treatment of *p*H within the proper operating range.

Safety

The chlorine supply area and the inlet compartment to the reaction tank are equipped with exhaust hoods to remove any gas that may escape during cylinder changeover, or from the reaction itself in the event of caustic supply failure or strong waste concentrations. An alarm in the chlorine supply system warns on falling gas pressure, indicating the need to switch over to fresh cylinders.

DISCUSSION

The foregoing "Case History" touches on one phase only of plating waste treatment. Certainly a good portion of today's plating establishments have found the answer to plating waste treatment by utilizing destruction methods, recovery methods, or a combination of both, depending upon the type and quantity of contaminants. In this case, cyanide waste was the offender A treatment plant requiring initial, low investment and economical treatment costs has been presented. That the treatment plant is accomplishing its intended purpose has been attested to by analysis of the plant effluent for cyanide.

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Fig. 1

LOW-COST INTEGRATED WASTE TREATMENT AT AMERICAN STERILIZER

by JOHN STROH and CLIFFORD ALLEN*

As THE COUNTRY'S largest manufacturer of hospital sterilizing equipment, American Sterilizer Company produces hundreds of chrome-plated parts in a wide assortment of sizes and shapes. The plating department occupies about 3 per cent of the space in the new plant (260,000 sq ft total) and includes a staff of 25 men. Although American Sterilizer has been in business for more than 60 years, the Company did not face the problem of disposing of plating wastes until December 1955, when it moved its main plant and headquarters from the city to the suburbs of Erie, Pennsylvania.

Since the original plant was located within the city limits of Erie, all plating wastes were fed directly into the city sewers. The wastes were rendered harmless by the simplest and most economical means—dilution in the municipal waste disposal system. However, the present location of the plant is not served by the Erie sewer system, so that long before operation began here 18 months ago, the various methods available for eliminating plating room wastes effectively and economically were studied.

TYPES OF WASTE AND OBJECTIVES OF TREATMENT SYSTEM

In common with all chromium plating operations, the two principal types of waste which had to be disposed of were toxic cyanide and chromic ions. The cyanide waste is derived from drag-out in the initial copper plate and the chromic ion from the final chromium plate. In addition, convenient wash-down facilities for daily removal of spillage were wanted.

In designing the plating room (Fig. 1), the over-all objectives of the waste disposal system concerned both performance and economy. The system had to be completely effective (good reputation in a new community was important) and plating quality had to be maintained. As in any other plating organization, large or small, it was hoped to achieve these objectives at the lowest possible cost. Low initial cost was important in order to control the already high cost of the entire plant. Second, a waste disposal system that was unnecessarily expensive to run would be a hardship on overhead, particularly when waste disposal was previously not neccessary at all.

SELECTION OF INTEGRATED WASTE TREATMENT

The technical staff of the plating department reviewed the following four basic methods for removing the toxic cyanide waste:

1. Dilution of the toxic material to harmless concentrations.
2. Atmospheric oxidation in lagoons.
3. Volatilization of the cyanides and dilution of the gases with air.

*Supervisor and Chemist respectively, Plating Department, American Sterilizer Company, Erie, Penna.

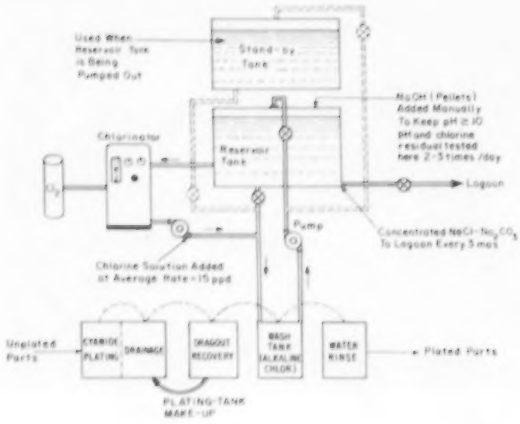


Fig. 2

4. Oxidation to non-toxic compounds by alkaline chlorination.

Alkaline chlorination was selected because it would result in complete destruction of the cyanides and is a fast reaction that is inherently easy to control.

While both batch and continuous systems for alkaline chlorination have been conventional practice for many years, the financial investment in plant space and equipment seemed excessive for an operation of this size. For this reason, the integrated waste treatment system developed by Dr. Leslie E. Lancy was selected. Dr. Lancy developed a system for American Sterilizer's particular requirements based on other integrated waste treatment installations which had been operating with approval from the Pennsylvania State Department of Sanitation.

A similar integrated waste treatment system was also designed by Dr. Lancy to dispose of the chromic acid waste and rinse waters in the chromium plating lines. Although the reagents in the cyanide and chrome systems are quite different, the disposal solutions for each type of waste are incorporated into the plating lines in a similar manner.

PERFORMANCE OF THE INTEGRATED SYSTEM

Experience in the last 18 months of operation since the plant opened has exceeded expectations, both in performance and cost. Because of more uniform, reliable removal of drag-out from both the cyanide and chrome treatment washes, better plating is being achieved more consistently than was possible at the previous location. Frequent chemical analyses, reported monthly to the State Department of Sanitation in Meadville, Pa., have never indicated any trace of toxic waste in either the discharge to outside holding lagoons or in a nearby creek into which water rinse solution is discharged.

COST

The total initial cost for the integrated waste treatment system for both cyanide and chrome waste was approximately $15,000. The original study of the various treatment methods showed that a conventional system would have cost the company about $50,000—over three times as much. It is hardly necessary to state that, assuming equivalent results could be obtained, this difference had considerable influence on the decision.

There has also been a substantial saving in operating cost with the integrated waste treatment system as compared to what it would have been for the continuous and batch methods. Benefits in the cost of operations include:

1. **Reduced labor costs**—supervision and control of the waste treatment system requires very little time and fewer chemical technicians than the other systems, since the reagent chemicals may be added in excess without harming the effectiveness of the system.
2. **Low maintenance**—little is required beyond routine cleaning out of the treated-waste reservoirs.
3. **Reduced water consumption**—less water is used than in either of the conventional disposal systems or in our previous facility, where there was no disposal at all.
4. **Low cost of chemical materials**—the total cost of both gaseous and dry materials used has averaged only $8 per day.

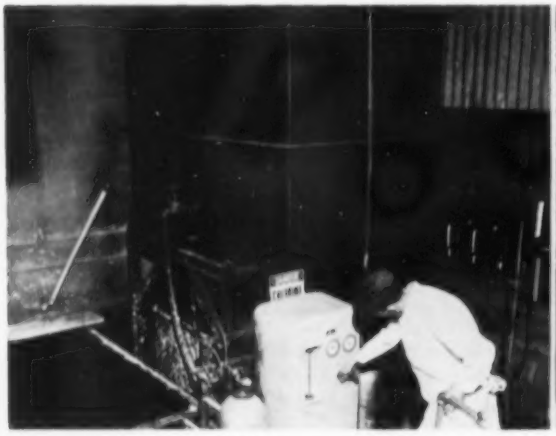


Fig. 3

Fig. 4

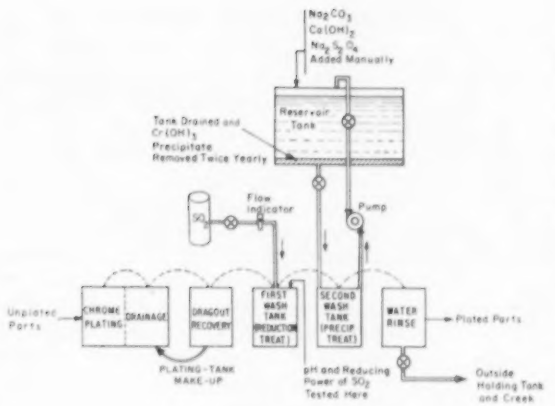


Fig. 5

CYANIDE INTEGRATED WASTE TREATMENT

American Sterilizer's integrated cyanide waste treatment system is shown schematically in Fig. 2, where the toxic waste is treated by alkaline chlorination in the 200-gallon wash tank as a regular step in the plating line. The wash tank is connected to a 1250-gallon reservoir tank (bottom center in Fig. 3) located in another section of the plating room to form a continuous recirculation system. The treatment solution washes the drag-out from the work and plating racks in the wash tank and is continuously circulated to the reservoir. The pH of the treatment solution in the recirculation system is maintained at 10 or above by feeding sodium hydroxide by hand periodically to the reservoir tank (Fig. 3). Although soda ash (sodium carbonate) is often used as the alkali, sodium hydroxide is preferred because pellets have been found easier to handle than a powder and less sludge is formed.

As shown in Fig. 2, a by-pass stream from the reservoir to the wash tank in the plating line passes through a continuous gas chlorinator, where chlorine is added at a rate sufficient to maintain a chlorine residual in the range from 300 to 700 ppm. Chlorine dosage is at an average rate of 15 pounds per day, so that total daily consumption is about 10 pounds in two 8-hr shifts in the plating department.

The chlorinator is a vacuum-type, solution-feed unit.* This means of chlorination has been very convenient since the rate of flow is easily adjusted manually at the chlorinator (as is being done in Fig. 3), and there has been no problem with the escape of chlorine gas or corrosion.

Chlorine residual in the reservoir tank is checked daily by a simple color-comparison test. The rate of chlorine feed is increased when the chlorine residual nears the low limit and decreased when there is an excess. A sample of the solution in the reservoir tank is tested for pH at the same time on a standard pH meter. When insufficient alkali is indicated, the sodium hydroxide is immediately added until the pH reading is at least 10; an excess of alkali is of no concern.

*Manufactured by Fischer & Porter Company, Hatboro, Pa.

Because most of the reaction between the treatment solution and drag-out takes place immediately in the wash tank, gaseous reaction products, carbon dioxide and nitrogen, are dispersed in the plating room. A concentration of sodium chloride and sodium carbonate solution then gradually builds up in the recirculated treatment solution. About every three months, all treatment solution in the system is pumped from the reservoir tank to the lagoons, one of which is shown in Fig. 4. These two lagoons are thus being slowly filled with a non-toxic, highly concentrated sludge of sodium chloride, sodium carbonate and metallic ions. Probably in several years it will be necessary to reexcavate.

Although the cyanide waste system operates with high excesses of chlorine and alkali, the use of chemicals is very economical since the treatment solution is discarded only at the three-month intervals when the reservoir tank is emptied. The large stand-by tank above the reservoir tank (Fig. 2 and upper center in Fig. 3) supplies the treatment solution to the recirculation system while the reservoir tank below it is being emptied into the lagoon.

CHROMIUM INTEGRATED WASTE TREATMENT

The integrated system for treating toxic chrome waste is shown schematically in Fig. 5. The hexavalent chromium is reduced to trivalent chromium in the first wash tank, and the trivalent chromium drag-out is precipitated in the second wash tank. In Fig. 6, a round sterilizer door has just been removed from the first wash tank and will be lowered into the second wash tank in the foreground. The reducing agent in the first wash tank is gaseous sulfur dioxide which is added continuously to the solution in the first wash tank at a controlled rate. Sulfur dioxide is used because it is low in cost, requires no special precautions, and its dosage can be easily controlled. The pH of the solution in the first wash tank is maintained at about three and is checked in the tank with a pH meter several times a day. The flow rate of the sulfur dioxide is adjusted manually to control the sulfur dioxide concentration as indicated by pH and analysis for SO_2 reducing power.

The soluble trivalent-chromium drag-out on the work

Fig. 6

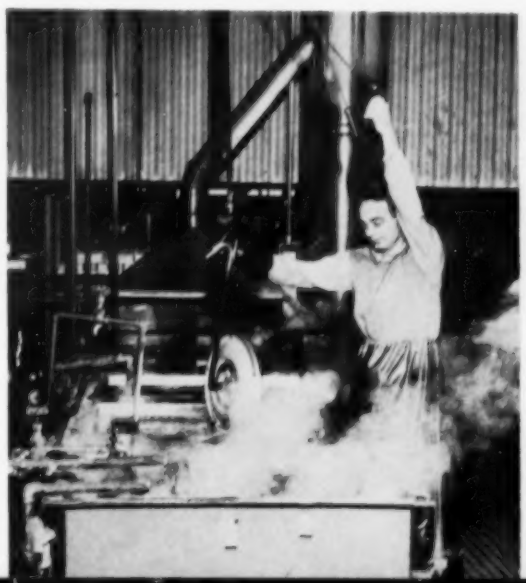


Fig. 7

and plating rack as they leave the first wash tank is reduced to insoluble chromous hydroxide in the second wash tank by a solution of sodium carbonate and lime, with sodium hydrosulfite added as an extra precaution for any free chrome. The second wash tank is connected to an open 1250-gallon reservoir tank (lower left in Fig. 3). The alkaline solution is continuously recirculated between the second wash tank and the reservoir tank. The alkali is added to the treatment solution at the reservoir tank, in the same manner and at the same location as for the cyanide system. The chromium-hydroxide precipitate in the reservoir tank is discarded after draining the tank to the lagoons about every six months.

The overflow from the fresh water rinse tanks in the cyanide and chrome plating lines (Figs. 2 and 5) is fed continuously to an outside holding tank (Fig. 7). A weir then discharges the rinse waters into a nearby creek. The creek runs through residential areas where children play in summertime, and there has never been a trace of toxic waste detected in regular periodic tests since operation began.

Further protection against toxic solution is provided by a continuous alarm system on all steam lines in the plating department. All steam return lines are monitored by a pH meter to indicate an immediate alarm when even the minutest leak occurs in the pipes immersed in cyanide solutions. Although the possibility is quite remote, a leak might allow cyanide solution to go back to the boiler and from there into the city water system.

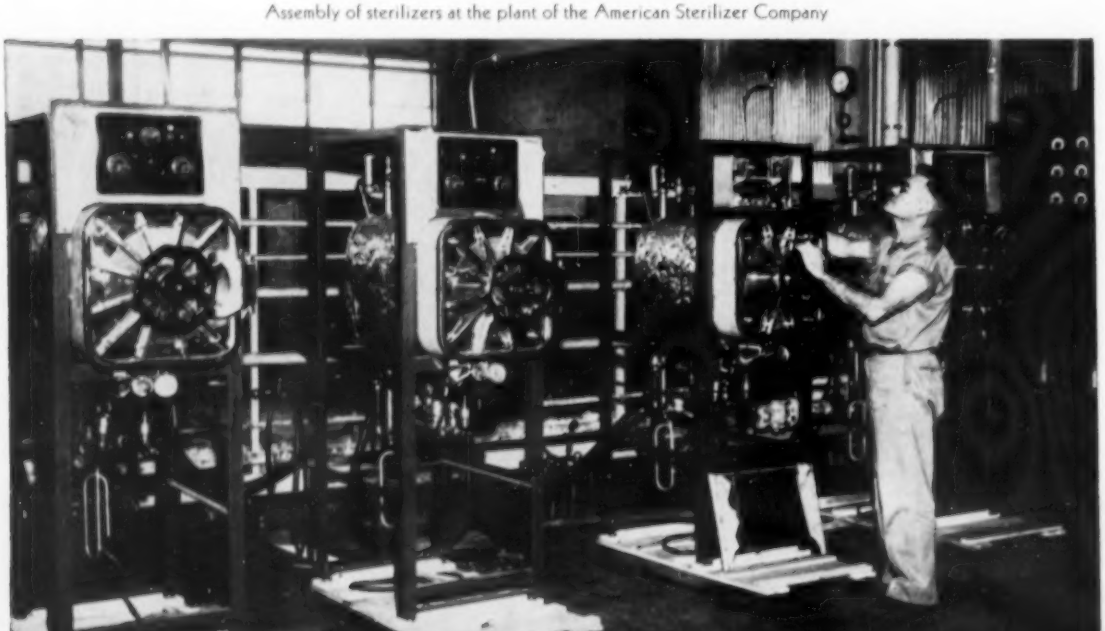
DAILY SPILLAGE DISPOSAL

Any plating solution, wash water or chemicals that may have spilled on the floor are removed daily. The entire floor is concrete with drains at the lowest points, and all operators stand on raised wood platforms. At the end of the second shift each day, the entire floor is hosed down with water and the wash is drained to an underground reservoir tank outside the plant. The tank is allowed to fill up to a specified level, at which point an alarm is automatically sounded. Chlorine, in the form of calcium hypochlorite, is then added to the underground tank about once a month to oxidize any cyanide which may be present. Hexavalent chromium is next reduced by the addition of sodium hydrosulfite. When tests in the underground reserve reservoir tank show that the complete destruction of cyanide and hexavalent chromium has been achieved and the solution is neutralized and harmless, the waste solution is discharged into the lagoon in Fig. 4.

Clifford Allen graduated from the University of Pittsburgh in 1938. He has been associated with the American Sterilizer Company since 1939. His job covers the analysis and control of plating processes and quality control and identification of alloys.

John Stroh, foreman of American Sterilizer's polish and plate department, graduated from John Carroll University in 1931. He has been associated with the American Sterilizer Company since 1937.

Assembly of sterilizers at the plant of the American Sterilizer Company



CURRENT TRENDS IN PLATING WASTE ABATEMENT†

by

C. FRED GURNHAM*

THE ELECTROPLATING INDUSTRY, particularly in Canada and the United States, England and Germany, has long been aware of the necessity for waste abatement. The highly toxic nature of many plating-room effluents causes troubles that are almost unique among industrial waste problems. This has been recognized within the industry, and practical or applied research was initiated about fifty years ago.[1,2] Organized attacks on fundamental or basic problems of plating waste abatement are more recent. The program of the American Electroplaters' Society is ten years old this year, and other groups such as the British Water Pollution Research Laboratory have been conducting research in this field for about as long.

Reduction of Waste

The most conspicuous trend or emphasis in plating-room waste abatement, in recent years, has been the reduction or elimination of waste within the plating room itself. This trend is not confined to the metal finishing industry, but is generally typical of all process industries. In all probability this emphasis on waste reduction will not only continue into the future, but will increase. The elimination of a waste at its source is almost always a direct economic gain to the industry; furthermore, it removes the necessity of treating or otherwise processing the waste for disposal.

This present-day trend toward waste reduction ties in closely with the great need for water conservation. Available water supplies in most regions are probably not actually dwindling, but they appear to be because of the ever increasing demands for water by industry, municipalities, agriculture, and recreational interests. The elimination of an industrial waste frequently implies the conservation of an equivalent volume of water, hence these two desirable policies directly complement each other.

The electroplating industry, like many other wet-process industries, must use considerable quantities of water; yet no part of this water is sold in the final product. All water purchased or pumped by the industry, or by any single plating shop in the industry, must be disposed of as waste.

If metal finishing process water can be utilized twice instead of once in its passage through the plant, the raw water purchase cost is halved and the cost of disposal is also reduced. Similarly, if smaller quantities of water can be employed for a given job, economies in both purchase and disposal are realized. These accomplishments must, of course, be obtained without significant sacrifice in product quality. This limitation makes the achievement difficult, but far from impossible. Other possibilities for water and chemical conservation will occur to an engineer studying electroplating wastes; these techniques for in-plant waste reduction will comprise the principal portion of this discussion.

Engineering Design—Waste Disposal

Of four broad approaches to plating-room waste abatement, first is engineering design. The factors to be discussed are best built into a plating plant in its original layout, design, and construction. They can be added to an existing plant, although usually at greater cost than if provided originally. Even if this greater cost is necessary, the engineering improvements may be well worth while.

In any wet-process industry—and electroplating is no exception—multiple sewer systems present many advantages. Cost is, however, an opposing factor, and must be balanced carefully against the merits of separate sewers. Each plant is different, and must be studied as an individual problem. Consider the hypothetical—and very unrealistic—plant where cost is not an object. What sewer lines are desirable under these Utopian conditions?

One sewer would be desired for the sole purpose of

*Department of Chemical Engineering, Michigan State University, East Lansing, Michigan.

†Presented at the Ontario Industrial Waste Conference, June 10, 1957.

collecting and transporting clean water, used but not polluted. This line would carry storm water from the plant area, plus uncontaminated cooling waters. Cooling systems are needed in several types of plating process, and the used cooling water is warm but not otherwise polluted. These wastes can be discharged freely to a drain or stream or sewer. It would be preferable to recover them for re-use in the plant, but this topic comes later in this paper.

An idealized plant (in which cost is not being considered) would have a second sewer line to carry contaminated process wastes. These would include used rinse waters; discarded solutions like cleaning solutions, pickles, bright dips, and occasionally (but rarely it is hoped) a spoiled plating bath; spills; drippings; floor washings; and tank wash waters from plant cleaning operations. In a plating plant, this sewer might have to be constructed in duplicate: one line for acid wastes and one for alkaline. Cyanide wastes should not be permitted to mix with acids, for obvious reasons; hence the necessary duplication of process-waste sewers.

The third type of sewer line in an ideal plant would carry sanitary wastes—from toilets, wash rooms, drinking fountains, and the like. Obviously these should not enter the clean-water line. They should be segregated also from the process wastes, since each interferes with treatment and disposal of the other.

In addition to these three—or four—main types of sewers, there are a number of special-purpose waste lines that should be included. This multiplicity of pipes may sound ridiculous to the old-time plater, who was accustomed to dumping all waste liquids into a common sewer with no regard for stream pollution or the operation of his municipal sewage treatment plant. Under certain conditions, of course, it would be ridiculous; a small, carefully operated plating shop in a large industrial community may often be permitted to discharge all its wastes into the city sewer. In large plants, however, and in rural areas, the more complicated sewer layout is not only necessary but is often justified economically. Several such plants have been built during the past few years.

These special-purpose waste lines preferably should be called "recovery" lines. A number of plants find it desirable to collect separately such effluents as rinses from copper, nickel and chromium plating, and to salvage the metal and water content of these wastes by ion exchange, evaporation, or other techniques. It is essential, for such recovery, that the rinses be kept separate, and not contaminated by the addition of other wastes. Metal recovery from a mixed plant waste is practically impossible, and certainly not economical. Transport lines for these individual liquids are not usually gravity-flow sewers; instead, the spent rinses are picked up by pumps from small sumps located close to the plating tanks, and are conveyed through pipes, often overhead, to the recovery area.

A considerable number of sewer lines have been listed which advantageously might be installed in an ideal plating plant. Several large plants actually use as many as suggested, and find it definitely advantageous to have them. In other plating shops, especially in small plants, several can be omitted because the economic factors are different. In any new plant or plant undergoing modification, all should be considered and the decision should be based on practical economics.

Another factor of engineering design that directly affects waste disposal is the process of waste equalization. Stream pollution problems and problems of sewage plant operation are more often caused by uneven or peak flows than by the uniform discharge of plating wastes. Acclimatization of stream life or of treatment-plant microorganisms may be possible if toxic wastes are discharged slowly and steadily, but the "slugging" of wastes can upset the entire biological system, often for a long period of time. The plater has both types of discharge: relatively weak and uniform wastes in his continuously flowing rinses, and slugs of concentrated wastes in his periodic or irregular dumpings of spent or spoiled solutions, and during clean-up periods.

Good engineering design, even in a plant already built, can reduce the suddenness and the severity of shock discharges. Proper plant operation is even more important and will be discussed later, but plant design is also a major factor.

The technique of equalization is simple, although there is opportunity for many modifications in its application. Basically, a holding tank is incorporated into the waste line, in order to provide time for the dilution of peak concentrations by the weaker wastes which precede and follow them. Mixing is essential, and may be caused by proper baffling of the natural flow, or by mechanical means. The time of detention is a matter of engineering calculation and judgment. A 24-hour lagoon should provide adequate equalization for any situation; space for this, however, is rarely available, and the designer must be content with far less. Even a 15-minute equalization period, in wastes as subject to fluctuation as plating-room effluents, is worthy of consideration, and the designer should take advantage of whatever facilities he can find or invent.

Engineering Design—Water Use

The waste disposal system itself is not the only opportunity for pollution abatement by the design engineer. He can also contribute by a study of water usage. In this study, the waste abatement engineer may appear to conflict with the plater because the latter will not hesitate to demand large quantities of high-purity water in order to ensure the quality of his plated product. There should be no compromise on product quality, but the water requirements to achieve quality can often be greatly reduced.

Except for their final discharge to a receiving stream or to a sewer, all wastes should be kept in as concentrated a form as possible at all times. At the ultimate plant outfall, dilution is desirable; but at any prior point, as long as there is any prospect of salvage or any plan for treatment of the waste, the maximum possible concentration should be maintained. Both salvage and treatment are more effective and more economical with high-strength wastes. This implies that waste cooling waters and other diluents should not be mixed with a waste stream that is to undergo processing; it means, further, that the waste itself should originate, within the manufacturing process, in as concen-

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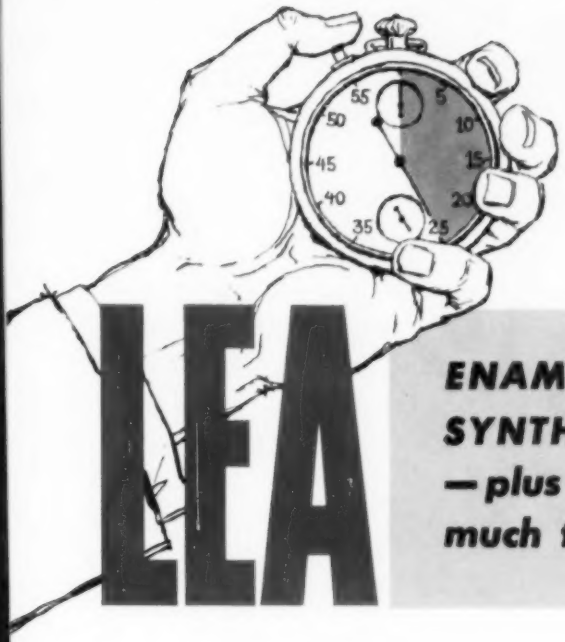

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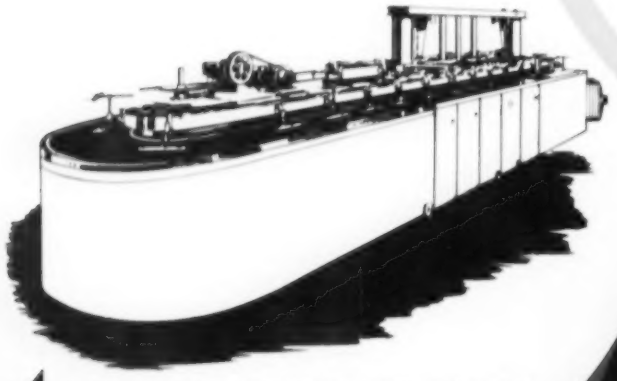

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trated a form as possible. The economical use of process water is an important factor in attaining the latter goal.

Most plating-machine operators and even some plating-room foremen, cannot tolerate a partly open valve. Rinse tanks, therefore, run at full flow and full overflow, even though a few gallons per minute might do just as satisfactory a job of rinsing. This practice results in an expensive loss of water and *it makes more difficult the task of waste recovery or waste treatment.*

It is not sufficient to tell the plant people that wasteful usage of water is undesirable. It is possible, however, for the plant engineer to insert restrictions in the water line to prevent flows greater than the necessary rate. This practice, is recommended but caution should be taken on two counts: do not make the orifice or other restriction so small that it clogs and diminishes the flow too far; and do make provision for rapid filling of the tank after clean-out and other dumpings.

Some plating plants have solved the problem of keeping rinse flows to a minimum by using a control valve on the input line, and regulating this valve by conductivity or similar measurements on the rinse water. This technique, when it can be employed, provides a controlled-volume rinse that is fully automatic.

Another engineering technique that serves to minimize rinse flows is the use of spray rinses directed at the plated work. As the work is lifted from the rinse tank, it passes through a fine jet or fog of fresh rinse water. This provides countercurrent rinsing, and is far more effective than simple dip-rinsing in a tank of water. The spray serves also to maintain the tank full of water, and does so more efficiently than a large-volume input pipe or hose. A further refinement of spray or fog rinsing is timing the spray so it operates only when plated work is being lifted through the spray zone. This permits really effective rinsing with minimum water volume. Such rinses have even been employed directly over plating tanks, provided that evaporation of liquid from the tank is sufficient to prevent overflow.

One further example of engineering design as a means of reducing waste, and also of salvaging valuable plating chemicals, is the provision of adequate drainage time for plated parts or parts in process. As much time as possible should be allowed for drainage and dripping back into the process tank, in order that this liquid may be salvaged instead of being transferred to the rinse water and to waste. The time required for drainage depends principally on the shape and size of the plated work, and is affected by solution viscosity. A minimum drainage time of 15 seconds has been suggested; a longer period is often desirable.

Some plants have installed air blasts or air "wipers" to remove excess liquid from plated parts as they are drawn up out of the process solutions. This is not such a powerful blast that it scatters solution all over the surrounding area, but is a gentle blowing that serves to dislodge and recover hanging droplets. The air blast technique is not adaptable to some shapes and sizes of plated ware, but performs an excellent job on others. I have seen it used in the continuous plating of wire, which is perhaps an ideal set-up for this operation.

Process Changes

Engineering design is a factor in plating waste abatement because it offers many opportunities for large benefits. This is particularly true when the design precedes plant contruction, although several of the principles given are applicable also in an existing plant. Many of these changes can be adapted to plating shops after construction, and even during operation. First, consider modifications that can be made in the actual plating processes.

Platers have continuously sought, through their research organizations, for new types of plating solutions and new techniques or processes of electrodeposition. The usual goals have been an improved plated product or a more economical production procedure. Another goal, lesser but nevertheless recongnized, is curtailment of water pollution. Some researches have been directed specifically toward that end.

A major contention between platers and those whose principal thought is anti-pollution has long been the cyanide question. The very toxic cyanide chemicals have always been essential to some of our most important plating processes. The plater would like to stop using cyanides, just as all of us would like to have him do so, but he cannot. There is no effective replacement.

It may be said that copper, for example, which is commonly deposited from a cyanide solution, can also be plated from a copper sulfate bath that contains no cyanide. This is true, and large tonnages of sulfate-electroplated copper (as well as electrorefined copper) are produced commercially. But the two types of copper plate, sulfate versus cyanide, are vastly different in their metallurgy, their physical properties, and their uses. It is a rare application that can utilize the two types of copper deposit without distinction. Accordingly, sulfate copper is not often a replacement for cyanide copper, and the cyanide waste problem cannot be appreciably reduced by this means.

Other copper solutions than the sulfate hold more promise for a decrease in cyanide usage. Phosphates, organic amines, and many other copper compounds are currently being studied, and some have reached full-scale application. Most of these have been developed by individual companies, including suppliers, and so are either secret or proprietory in nature; this, in addition to higher material expense, increases the cost of such processes for the general user. For this reason, together with technical difficulties, it is not expected that the substitution of another type of solution will solve the cyanide problem in the near future. It is quite possible that some platers, probably in small rural shops, have adopted non-cyanide plating solutions with the principal purpose of eliminating stream pollution.

As far as the metal ions are concerned, there is little hope of relieving the waste problem by process change. Many of the commonly plated metals are about equally toxic, so there is little gain in substituting one for another. Furthermore, each metal is used by the plater because it performs a specific duty and is the best for that purpose when all factors are considered. Substitutions were in use during the war, because of metal shortages, but no one was happy with them, and it cannot be recalled that the waste problem was alleviated in any instance. All in all,

little hope can be offered for progress through this type of process change.

In non-plating processes used by the plating industry, such as metal cleaning prior to plating, substitute processes occasionally have merit. In the closely related iron and steel industry, for example, waste abatement benefits as well as product improvements have resulted from sodium hydride descaling as an alternate technique for acid pickling. The hydride process has been adopted by several mills, and largely eliminates the waste problem of spent pickle liquor. This process can also be used in the cleaning of metal parts prior to electroplating.

The plating industry uses a number of finishing treatments that may cause pollution troubles from acids and other constituents. Occasionally in this field there is room for improvement by substituting less objectionable chemicals for those usually employed.

A different type of process change involves redesign of the part being plated, or of the method of racking the parts for plating. Consideration should be given to possible changes in shape or position, to permit better drainage of solutions after processing, and correspondingly reduced carryover of process solutions into the rinse tanks. Sometimes very minor design changes can result in great improvements, both in waste reduction and in process economy. A classical example of this was the redesign of an automobile bumper, locating a bolt hole so it served also as a drainage hole, which permitted recovery of about a pint of full-strength plating solution per bumper plated.

Salvage and Recovery

In the plating of precious metals, like platinum, gold, and silver, waste recovery has been practiced for years. With the more common metals, which are plated in much larger volume, this has not been true. Recently, however, for a number of different reasons, a definite trend toward the salvage of materials has been evident. These reasons include: increased knowledge of recovery processes, savings due to metals and metal salts salvaged, improved economy in water consumption, and, of very real and practical importance, abatement of pollution.

It has already been pointed out that wastes which are to be processed for salvage and recovery should be kept separate from all other wastes. Let this fact be re-emphasized. It is practically impossible, and certainly not economical, to salvage nickel, for example, from a mixed waste of nickel, copper, and chromium. The further incorporation of floor sweepings and sanitary sewage complicates the picture even further.

By proper design and operation of the rinsing step, most of the chemicals lost from plating tanks by drag-out on the plated work can be salvaged and re-used. A still rinse or standing rinse should be provided for the first dip after each plating step; for example, after chromium plating. In theory, this rinse will gradually increase in concentration until (at infinite time) it is equal to the plating solution. In practice, this standing rinse water is transferred into the plating tank as rapidly as possible, to make up for evaporation and other losses. The chromic acid or other plating chemicals are thereby salvaged, with an obvious economic advantage as well as the benefit that they are kept out of the waste stream. As liquid is removed from these save-rinse tanks, it is replaced with fresh water or, better, with overflow water from the rinse tank next in series.

Evaporation techniques are being employed at a number of plants for the concentration and recovery of plating rinse waters. This is particularly desirable when vaporization losses from the plating solution are not large, and only small quantities of make-up water can be used. Multiple rinse tanks with countercurrent flow provide an overflow liquor of reasonable concentration for charging to an evaporator. The partially evaporated or concentrated product can be returned to the plating tanks to furnish make-up of both water and plating chemicals. Some plants have encountered opposition from their plating foremen to such returned liquors, but the fact that no difficulties were experienced, plus the obvious economic advantages, soon overcame this dissent.

Chromium rinses were probably the first type of plating waste to be reclaimed by evaporation. Glass-lined equipment is generally used; this is expensive, but the salvaged materials rapidly amortize the original investment. More recently, evaporation has been used to concentrate rinses from nickel plating and from the cyanide plating of copper, zinc, and cadmium. Vacuum evaporators are commonly used, and multiple-effect evaporators are employed in some installations. The water recovered by evaporation is often important economically, because it needs no softening or other treatment before re-use. Condensate from chromium rinse evaporation may contain a small content of chromate ion, resulting from carry-over in the evaporator; this is not high enough to interfere with its re-use for rinsing. In at least one plant, such condensate has been utilized for boiler make-up, where the chromate serves as corrosion inhibitor.

Use of ion-exchange techniques for the recovery of plating chemicals from rinses is becoming wide-spread in the United States. Copper and nickel salts are salvaged by this method in many plants. Ion exchange was formerly not suitable for treating chromate solutions because these oxidized and destroyed the ion-exchange resins. Recent research has resulted in chromate-resistant resins, so chromate recovery and concentration is now possible. Furthermore, such resins can be used to remove unwanted contaminating ions from chromate solutions, permitting longer use of the chromates, as in anodizing. Ion exchange has been investigated for cyanide recovery, but this is not yet successful on a commercial scale. The principal problems are poisoning and clogging of the resin bed, precipitation of metals within the bed from metallocyanide complexes, and the fundamental fact that hydrocyanic acid is a weakly ionized material.

It is only fair to point out that the capital investment required for plating waste recovery may be greater than the corresponding cost of a plant for treatment by destruction of the waste. However, it is equally important to mention the financial benefits that are realized in operating costs, due to credit for re-usable plating chemicals and water. In many installations, the original cost has been paid off rapidly by these savings.

Occasionally some constituent of a waste stream can be recovered as a by-product, even though it cannot be salvaged for re-use in the process. Contamination by mixed wastes may prohibit re-use, but need not prevent reclamation in some other form. For example, several companies have considered treating chromate wastes with barium hydroxide or other barium salt to precipitate barium chromate. This material is a valuable yellow pigment, used in the paint and ink industries. It is not believed that sales to pigment companies have been accomplished, but this is the type of by-product recovery that merits further study.

Other industries sometimes reduce their waste problems by re-using spent chemicals for some down-graded application in the process. The petroleum industry, as an example, uses and re-uses caustic soda for several different purposes before it is discarded. No good opportunities come to mind for this practice in the plating industry, but it is worthy of further study. Perhaps some of the stronger spent acids such as pickles and bright dips can be used for weak acid dips after caustic cleaning; although contamination by unwanted metal ions is a dangerous possibility. At the least, waste acids and alkalies can be employed to neutralize each other before discharge.

Water, of course, can be re-used several times in the plating shop, even without intermediate purification. Used cooling water, for example, has no contamination except an increase in heat content, and the higher temperature may be an advantage if the water is used for rinsing. Countercurrent flow of rinse water through a series of tanks has obvious advantages, and has been mentioned previously.

Good Housekeeping

Good housekeeping has less romantic appeal—less glamour—than methods for waste reduction already discussed: engineering design, process alterations, and the recovery of materials and by-products. To the uninitiated, good housekeeping may even sound somewhat sissified. To the experienced industrial man, this is not so; since he recognizes the complexities as well as the simple factors of good housekeeping, and the very tangible benefits realized from its practice. The food and drug manufacturers maintain and boast of their housekeeping activities for sanitary objectives; platers have not this same incentive, but should take pride in a neat and clean plant as a part of their good-neighbor policy in the community.

Good housekeeping in any company involves all of the company's employes. There are problems in plant operation, in engineering, and in administration. Without group effort, the goal is unattainable.

Typical of poor housekeeping in the plating room is the spilling of process solutions, so they enter the waste stream. The old-time plater considered spills an inevitable part of plating work; modern industry will not tolerate them. That is not to say that spills no longer occur—Utopia has not been reached—but spills are regarded as mistakes; mistakes, if foreseeable, can be prevented; and if a mistake or a spill does occur, because no one could or did foresee it, there is certainly no excuse for a second error. One helpful practice, long used in the petroleum and chemical industries and now becoming common in plating, is the construction of curbs or dikes around possible spill areas to prevent the escape of process liquids.

Common causes of spills in the plating room include tipping of small tanks, breakage of bottles and other fragile containers, slopping of liquids during transport, and overflowing of process vessels. All of these, and of other unnamed causes, are avoidable. The process and design engineers have a part of the responsibility: they can plan tanks that will not tip, choose container materials that resist breakage, plan piping and pumping systems to get rid of manual transportation of chemicals, and install float valves or alarm systems to prevent overflows. The operator has his part, much of which is obvious. No engineer can design a safety system which will resist forever the persistent attack of fools and ingenious operators. Plating room foremen and others of the administrative staff have their task in everlastingly keeping themselves and everyone else on their toes to prevent spills and other accidents. This is largely a job of persuasion, as the modern plant operator, with his independent attitude, does not take kindly to orders unless he understands the reasons behind them.

Another example of poor housekeeping is persistent dripping and leaking. Drips and leaks are bound to occur, but they should be corrected promptly, and in as permanent a manner as possible. It is the maintenance department's job to make the repairs, but it is the duty of the machine operator and of all other people to report the faults as soon as they are observed. Routine inspection and maintenance of known trouble-spots is a good idea, especially because it may correct trouble before it actually occurs; but this does not eliminate the responsibility of all to keep a constant lookout for leaks.

Dripping from work in process, as it passes between tanks, can usually be overcome by drip pans spanning the region between tanks and pitched to return collected liquid to the tank from which it came. Dripping may also occur from tank ventilation systems, particularly from gassy plating processes that cause a heavy mist of droplets to form over the solution. It is easy to say that proper design of the ventilating system and air ducts will prevent such drips; it is better to be prepared for small inadequacies in the design and to collect or correct the dripping if and when it occurs.

Leaks can occur at many points—all bad. Packing glands of pump and agitator shafts are bound to leak at times, and can be cared for by a regular routine of preventive maintenance. Corrosion, erosion, temperature changes, and other effects can cause leaks at many points in the process liquid system. These cannot always be anticipated, and only constant surveillance will keep them to a minimum.

The desirability of maintaining a clean plant implies the necessity for occasional clean-up operations. The cleaning process may itself be a major source of industrial waste and a cause of stream pollution unless it is properly planned and controlled. Floor washing, and cleaning of the outsides of tanks can be done frequently enough and at such staggered intervals that pollution from these sources is usually minor. If a waste treatment plant, even an equalizing basin, is available, these wash waters should of course pass through

it. A greater problem arises from periodic—perhaps semi-annual—cleaning of the insides of plating and process tanks, including the removal of dirt, sludges, scale, corrosion products, and plated parts that have fallen into the tanks.

A recommended technique for cleaning plating tanks involves pumping the complete contents, including movable sludge and such wash water as is necessary, to a temporary holding tank of adequate capacity. This liquid is allowed to settle while the plating tank receives a thorough cleaning, including scraping, removal of heavy sludge, and any other operations that are needed. The settled liquid is then pumped back to the plating tank, usually through a filter to remove solids that escaped settling. Addition of a small amount of plating chemicals may be required, to make up for dilution caused by the wash water. Sludge and liquid remaining in the holding tank can be processed more leisurely, by one or another recovery technique or, if necessary, by treatment to destroy it as waste.

Treatment and Disposal

Knowledge of the treatment or destruction of electroplating wastes continues to advance steadily each year. There have been no spectacular changes in commercial practice in recent years; present techniques perform an adequate duty, although at some expense. Chlorination remains the most common process for destroying cyanides; it is best conducted in the absence of unnecessary metals, especially nickel. This can be done only by segregating cyanide wastes within the manufacturing plant—a desirable practice for other reasons as well. Research studies on cyanide oxidation by means of ozone or by biological treatment have shown promise, but widespread adoption of these methods on a commercial scale is for the future. Metal salts that cannot be salvaged economically are commonly removed from the waste stream by precipitation with alkali; this procedure has been used for years. Chromate wastes from chromium plating and anodizing, if not recoverable, can be chemically reduced and precipitated.

Municipal sewer authorities show greater willingness to tolerate plating room waste in sewage than they did a few years ago. This may be in part a growing acceptance of industry as a partner in the community, and recognition of industry's tax payments as a major factor in municipal economics.

Metal finishing wastes intended for disposal to city sewers must continue to be regarded with respect and perhaps suspicion. Their toxicity may affect the secondary treatment of sewage, the digestion of sewage sludge, or the receiving stream at the sewage plant outfall. Adequate dilution at all points is highly important; this is most readily accomplished if waste reduction is practiced in the manufacturing process, and if pretreatment by equalization and neutralization is provided before discharge into the sewers.

Disposal of plating wastes directly to natural waterways is even more critical than when dilution by sewage is possible. Toxicity is again the important criterion, and adequate dilution must be provided under rigorously controlled conditions. Rural plants, which have no choice except discharge to a water-course, must generally employ extreme measures for in-plant elimination, and must then follow up with a treatment plant to destroy those wastes that cannot be prevented.

CONCLUSION

Treatment operations and final disposal of metal finishing wastes both emphasize the importance of eliminating or at least reducing the wastes at their points of origin. In-plant waste abatement aids both the economics and the efficiency of treatment and disposal steps. It is also an aid to overall plant economy, since reduction is waste means reduction in operating costs. The intended emphasis in this paper, and the emphasis that industry as a whole is giving to pollution abatement, are on waste reduction by means of proper engineering design and water usage, process changes if these are possible, salvage and recovery of useful constituents in waste streams, good plant housekeeping, and all other possible improvements in the manufacturing plant.

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[2]Dodge, B. F. and D. C. Reams, Jr., "Disposal of Plating Room Waste. II. A Critical Review of the Literature Pertaining to the Disposal of Waste Cyanide Solutions," Plating, **36**, 463–9 (1949); also Am. Electroplaters' Soc., Research Report No. 14, 45 pp; 1949.

Dr. C. Fred Gurnham, head of the Department of Chemical Engineering at Michigan State University, joined the MSU staff in July 1952.

Born at Ludlow, Mass., Dr. Gurnham received the BS degree in chemical engineering at Yale University in 1932, and the MChE and D Eng Sc (Chemical Engineering) degrees at New York University in 1940 and 1942 respectively.

Before coming to Michigan State, he headed the Department of Chemical Engineering at Tufts University, 1949–52; and was assistant professor of chemical engineering at Pratt Institute 1938–41. He has spent 15 years as a chemical engineer in industry.

In 1955, Dr. Gurnham received a distinguished alumnus citation from NYU.

He is a member of Phi Lambda Upsilon, Sigma Pi Sigma, Sigma Xi, Tau Beta Pi, AES, American Chemical Society, American Institution of Chemical Engineers, American Society for Engineering Education and Federation of Sewage and Industrial Wastes Association. He is a licensed professional engineer in New York and Michigan.

Dr. Gurnham is the author of the book, "Principles of Industrial Waste Treatment," and has written numerous articles for professional journals.

He is a consultant to the U. S. Public Health Service on relations with industry, and in 1956 served as chairman of the National Technical Task Committee on Industrial Wastes.

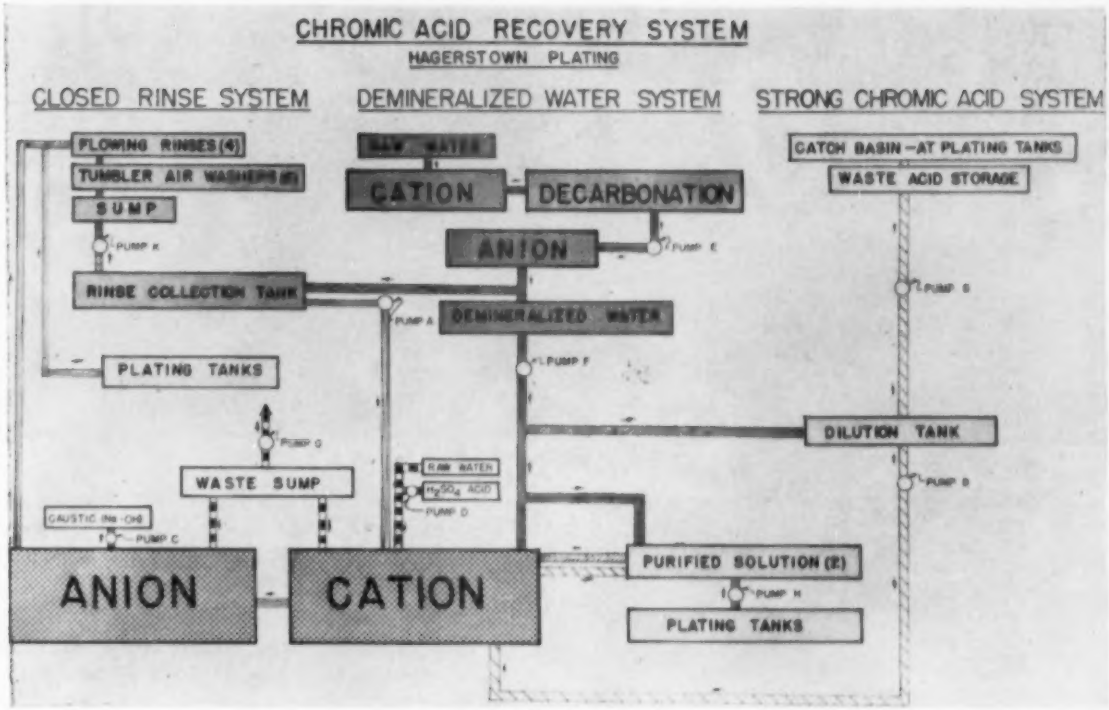

Fig. 1 Flow Chart.

OPERATING EXPERIENCES WITH CHROMIC ACID RECOVERY EQUIPMENT

by CLIFFORD L. GOUGH† and CHARLES G. BUELTMAN‡

THIS PAPER IS DESIGNED to pass along, to those who are presently operating ion-exchange units and others who are contemplating the installation of ion-exchange units for recovery of chromic acid from rinse waters and primary solutions, some of the answers we have found to the problems of obtaining maximum usage of the ion-exchange equipment and integrating the recovery units into the operating routine of the plating room.

Prior to the installation of the ion exchange recovery units, early 1956 and since production chromium plating began at this plant in 1942, there had been periodic improvements in waste disposal practices. The ultimate disposal had been by dilution to the White Water Canal. No chemical treatment had been employed for reduction of the chrome concentration for the dilution disposal calculations were based on a ten-year minimum flow in the White Water Canal. A list of the improvements made to facilitate the dilution disposal system includes:

1. Waste segregation
2. Use of salvage rinses
3. Non-drained catch basins beneath each plating tank.
4. Retention tanks for concentrated wastes
5. Sand filtration of concentrated wastes.
6. Controlled metering to plating plant effluent.

It had been apparent for some time that the dilution method of disposal offered no opportunity for discarding portions of the plating baths for controlling the metal contamination present in the baths. However, successful engineering toward slowing down the rate at which bath contamination developed kept dilution disposal effective.

Dilution disposal was, by all available measures, considered feasible and economical until early 1955. Shortly after Costa's paper on ion exchange was published, studies were initiated to determine the economics of chromium recovery at Hagerstown. Three studies were made during the period of 1950 to 1955, each study indicating a borderline payout time on the required capital investment. In 1955, the installation and operating cost estimates indicated a

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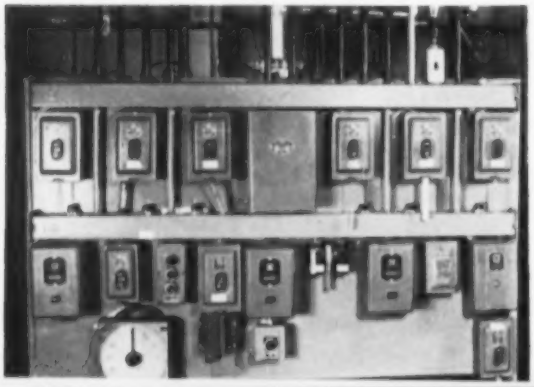
Fig. 2. Ion Exchange Units.

payout time of approximately seven years, and it was decided to install ion exchange equipment. (This payout time did not take into account the operating cost comparison with reduction and precipitation methods of treating chrome solutions for discharge to waste, which would reduce the payout time well below the seven years).

A study of the operating conditions in 1955, along with projection for future requirements, led to the drawing up of the following design factors for selecting ion exchange equipment:

1. Chromium should be recovered in a condition suitable for re-use in the plating baths.
2. Amount of chromium to be recovered from a closed system rinse would be approximately 100 pounds (as CrO_3) per seven-day week of 168 hours.
3. Removal of iron from the plating baths estimated at approximately 35 pounds per week maximum.
4. The cation exchange unit design to be the best compromise between recovery of chromium from rinse waters and removal of iron from strong solutions.
5. When recovering chromium from dilute wastes (rinses) the regeneration cycles to be 40 or more hours apart.
6. Static salvage rinses to be used after plating and prior to rinse in ion exchange flow.

Fig. 3. Centralized Control Panel.



7. Rinse system flow to be such that the total rinse tank volumes would circulate every five minutes.
8. Ion exchange rinse system to be the only source of dilute chromium wastes, and it to have a maximum concentration of 50 ppm of chromium (as CrO_3).
9. Design should permit system to operate while portions of it were being regenerated.
10. Each plating tank, of which there are 14, would require a minimum of 30 gallons of water per 24 hour day to maintain solution level.
11. System should include auxiliary equipment for making bath additions from regenerated acid fortified with flake acid.
12. Ion exchange shell should be capable of handling 170 per cent of the initial resin volume.

The system as designed and installed is represented by the Bar Chart of Flow (Fig. 1).

The chromic acid recovery equipment consists of two pairs of units each pair including one cation and one anion exchange unit, thus permitting continuous operation. The anion exchange unit is employed on the closed rinse system only, to pick up chromic acid from the recirculated stream. The cation exchange unit performs a triple function—a) to remove traces of metal from the recirculated rinse water, thus protecting the anion resin, and permitting a completely demineralized water to be returned to the rinse tanks; b) to convert the sodium dichromate recovered from the anion unit to chromic acid; and c) to purify the plating solutions by removal of iron, trivalent chromium and other metals.

In addition to the ion exchange units for recovering and purifying chromic acid, an additional pair of units were installed for the sole purpose of demineralizing raw water. The raw water demineralizer produces demineralized water to be used for a) make-up to the closed recirculation rinse system, due to evaporation and drag-out losses, b) solution additions to plating baths, c) regeneration of the ion-

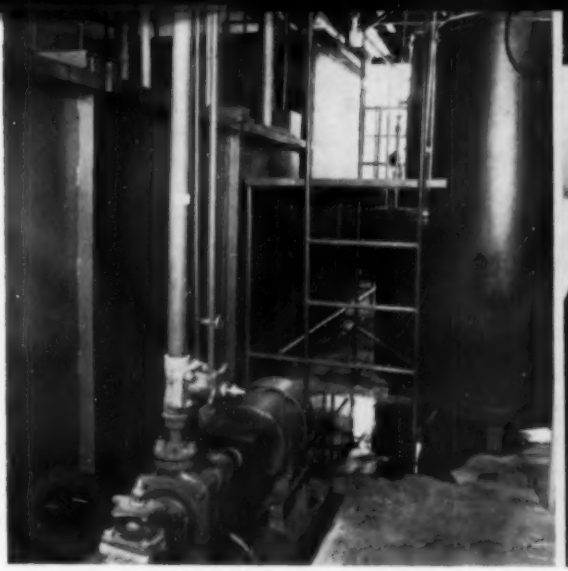


Fig. 4. Storage Tanks and Transfer Pump.

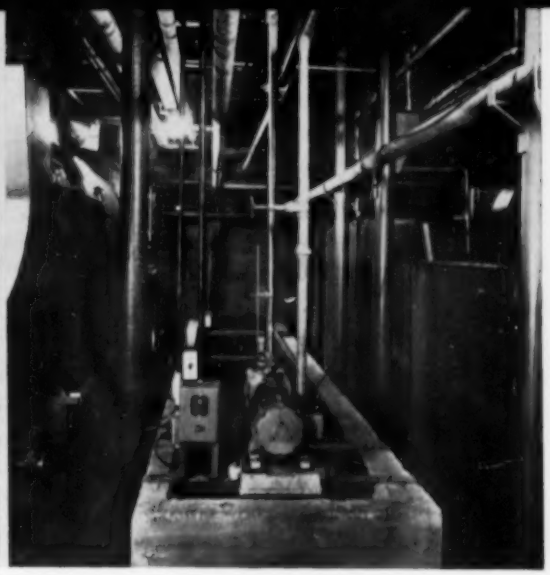


Fig. 5. Rinse Collection Sump.

exchange unit on chromic acid service. Thus a pure chromic acid is recovered for re-use by preventing any raw water contaminants from entering the closed system.

The ion exchange units as installed are shown in Fig. 2. The chromic acid recovery units are on the right and the raw water demineralizer units are in the center background. Fig. 3 is a picture of the control panel. The program clock for timing the various steps of operation of the ion exchange units is shown at the lower left of the control panel.

In order to obtain maximum efficiency from the ion-exchange units an extensive system of holding tanks and transfer pumps was installed as shown in Fig. 4, 5, 6, 7 and 8.

Under the design factors selected, specifically factors 10 and 11, allowance had to be made for addition of sufficient water to each plating tank to maintain operating solution level. These two factors facilitated the re-use of the chromic acid recovered from the recirculated rinses, which is recovered at about a one per cent concentration, without the requirement of an evaporator for reconcentration, thus reducing operating costs. These two factors also permitted dilution of the plating solution to a ten per cent concentration prior to treatment in the cation exchange unit for metallic cation removal. By reducing the bath concentration to ten per cent prior to treatment a much higher ex-

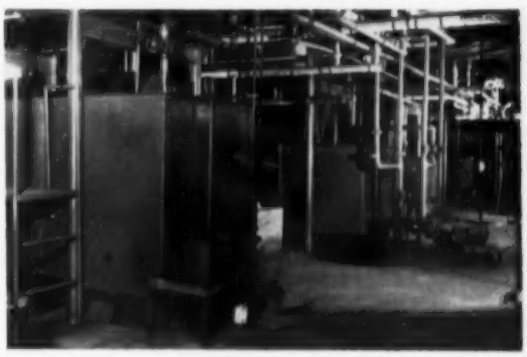


Fig. 6. Solution Storage Tank.

changer efficiency was obtained from the cation resin than if the bath had been treated at plating concentrations. Thus, the cost of regenerant chemicals for the removal of a unit of metallic cations was considerably reduced, again improving the overall operating cost picture.

The holding tanks permitted holding of a) plating solutions for dilution, prior to treatment; b) an inventory of

Fig. 7. Solution Transfer Pump.

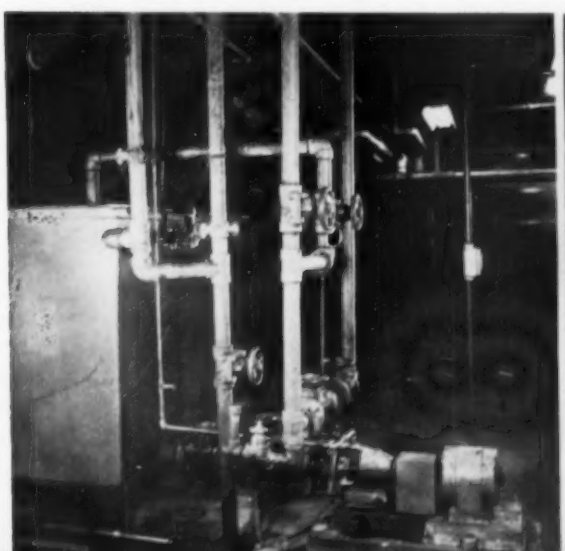
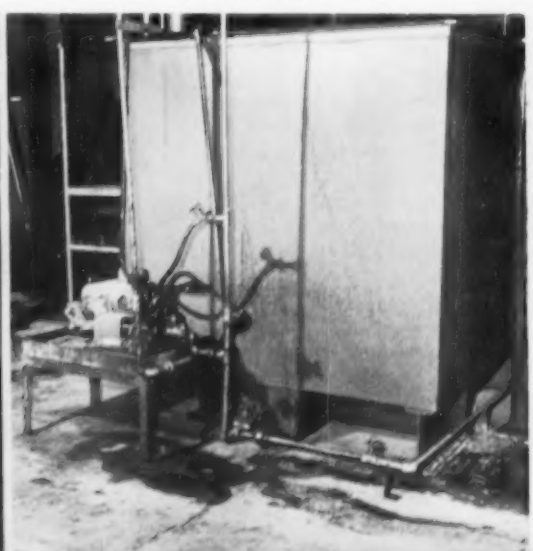


Fig. 8. Bath Addition Pump.



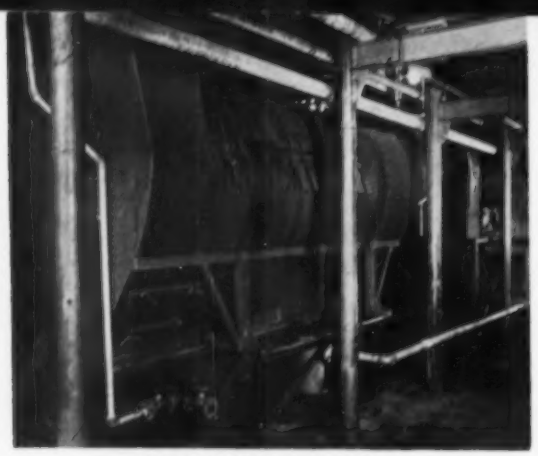


Fig. 9. Tumbler Air Wash Unit.

treated and purified solution to replace immediately bath solution removed from the plating line for treatment, thus not interrupting plating operations, and c) the fortification of chromic acid recovered from the recirculated rinse with flake acid to replace that chromic acid lost on the plated parts and due to reduction of hexavalent chromium to trivalent chromium inherent in hard chrome plating.

Installation was completed early in 1956 and on February 26, 1956 operations began. The first two months of operation were under the original design conditions. During this time the chromic acid recovery units on the recirculated rinse service operated for an average of 64 hours before reaching exhaustion. Except for minor problems, related to starting up and becoming familiar with the technique of operating a plant of this type, the equipment functioned as planned with only minor maintenance and minor alteration. Minor alterations included:

1. Re-location of a stainless steel valve in the sulfuric acid supply line to avoid pipe line and fitting corrosion caused by dilution.
2. Replacing butterfly valves which were ineffective for controlling levels in the demineralized water and rinse collection storage tanks.
3. Replacing rubber diaphragms with those of teflon in the Saunders Patent type valves in the sulfuric acid lines.
4. Piping changes to provide demineralized water at higher pressure during regeneration steps that require flow through conductivity probe lines.

Shortly after the ion exchange equipment was ordered in 1955 it was decided to completely change the exhaust air system. The former impact system of exhaust air cleaning was not adequate for the increased production that was planned. The new system included water washing of all exhaust air, a condition that was not taken into account in the original design factors. This air washing change imposed a dilute chromium recovery problem for which we had not designed. The decision agreed upon was to install the designed system and to rely upon finding a solution as the system was in operation or to alter the system to its full designed capacity (item 12 under design factors) if other methods failed.

After the two months of operation of the recovery system under design conditions the tumble air wash units (Fig. 9) were placed in operation. Now the overflowing rinses no longer returned by gravity to the rinse collection storage tank, but instead, were diverted through the washers to pick up the chromium content of the exhaust air. The rinse water passing through the washers now flows by gravity to a collection sump (Fig. 5) and is pumped to the rinse collection storage tank of the ion exchange system.

Immediately after placing the air washers on the line, operating time cycles of the chromic acid recovery units dropped to one fourth of their former value.

Operating data indicated that:

1. The number one pair of chromic acid recovery units was not equal in performance to the number two units.
2. Some method of measuring the amount of chromium exchanged during each cycle was necessary.
3. Exhaust dragout had to be minimized.

Inspections of the number one set of units determined that the resin had been thoroughly over-exhausted and that considerable fine turbid matter had plugged the resin beds. Triple regeneration and prolonged backwashing were employed to bring these units back to capacity, and measured cycles indicated that the exchange capacity had returned to original design values.

Measured cycles were determined by the use of a conductivity instrument and correlating the conductivity readings to ppm of CrO_3. Conductivity readings are taken of the influent to the units at predetermined intervals, correlated to ppm of CrO_3 and averaged for the volume of water treated during a cycle. Thus a method was obtained for determining the amount of chromium exchanged during a cycle. This method is feasible only because the recirculated rinse stream is made up of demineralized water containing only chromic acid with slight traces of sulfate and metals. This method is not feasible when a large percentage of interfering ions contribute to the conductivity readings.

Examination of the plating baths indicated that the plastic blanket of 1½ inch diameter polyethylene spheres was inadequate and that excessive bath agitation was being used, both contributing heavily to high chromium content in the exhaust air. Experimentation with various densities of polyethylene spheres led to the use of approximately 85 spheres per square foot. The increased bath coverage with the polyethylene spheres together with reduced bath agitation decreased the chromium concentration in the exhaust air sufficiently to increase the service cycles on the recovery units to 75 per cent of the operating time before the tumbler air wash system was hooked-up.

The above points out quite vividly how exhaust air can be the cause of considerable lost chromic acid. The installation of the tumbler air wash system caused an immediate drop in the recovery unit cycles to 25 per cent of the cycle time obtained under design conditions. Thus the chromic acid in the flowing rinses represented only one-fourth of the chromic acid being lost from plating with the exhaust system representing three-fourths. Proper blanketing of the bath and control of bath agitation reduced the chromic acid lost to the exhaust air by three-fifths.

CrO_3 Lost From Baths (lb/Cycle)

	Rinses	Exhaust	Total
A	100	—	100
B	25	75	100
C	75	25	100

A—Prior to Air Wash; B—After Air Wash; C—After Blanketing.

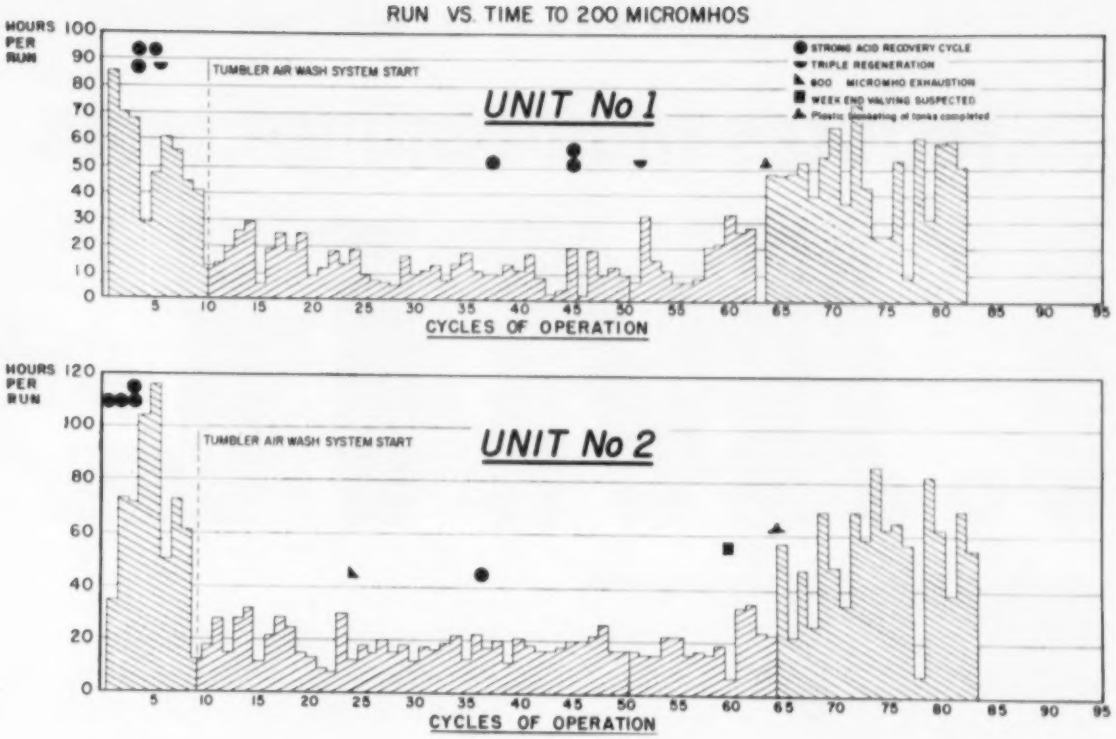


Fig. 10. Performance Chart.

Thus, proper blanketing and agitation have reduced the chromic acid lost to the exhaust system to 30 per cent of the total, with 70 per cent being in the rinse waters. This has reduced the load on the recovery units so that now the average hours of operation for each unit is approximately 50 hours.

When the operation of the recovery units stabilized, a job description was completed and the responsibility for the recovery system was reduced to one man on one shift a day. The program clock, previously mentioned, frees this man for other duties in the vicinity of the recovery units so that only 50 per cent of his time is chargeable to the recovery system. Supervision on other shifts need only know how to rinse a unit and put it into service when the other unit becomes exhausted.

Occasional cycles are at times still too short. Reasons for this appear to be:

1. Effect of high humidity after a period of low humidity causing exhaust air system to unload chromic acid from ducts, etc.
2. Valve leakage during recycle regeneration step.
3. Occasional excessive bath agitation.
4. Defective bath addition technique.

Work is continuing on the above items to minimize these difficulties. Thus far it has not been necessary to add the additional resin volume allowed for in the original design.

The performance chart (Fig. 10) illustrates the cycle time history of the recovery units during the time of adjustment described in the body of this paper.

Charles Bueltman graduated from Rensselaer Polytechnic Institute, Troy, New York, in 1947 with a BS. He received his BCE in 1948. He joined the Sales Department of The Permutit Company, New York, that same year. Mr. Bueltman is now manager of the Industrial Waste Treatment Department of Permutit. He is a member of the New York Branch AES.

Clifford L. Gough graduated from Purdue University in 1930 with a BSCE Degree. Since 1942 he has served in various capacities in the Engineering Division of the Perfect Circle Corporation, Hagerstown, Indiana.

At present, he is plating engineer for that corporation. His experience has been in Research, Specifications and Plating Process Engineering.

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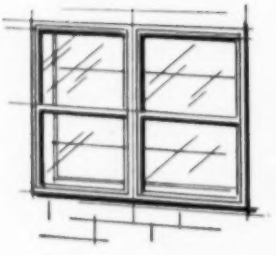

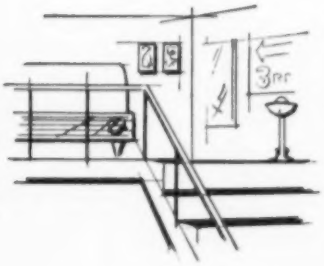

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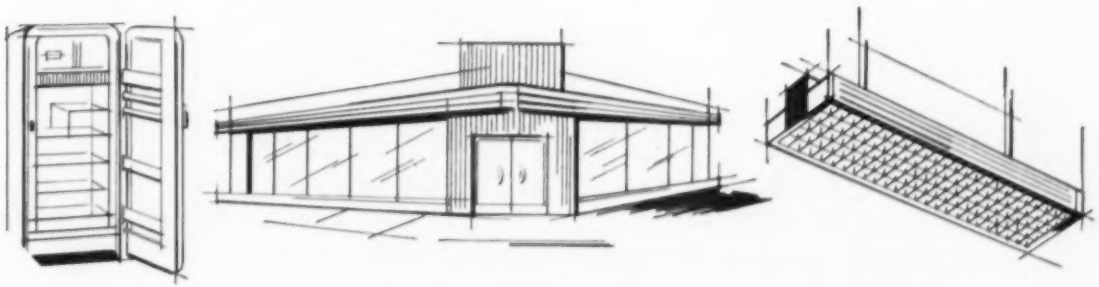

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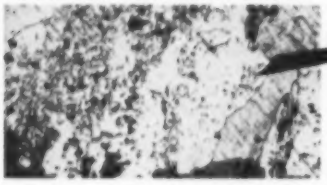
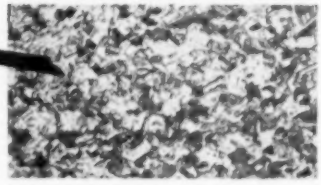


This Photomicrograph shows highly irregular, uncontrolled grain size—a major cause of shedding and resultant rough electrodeposits.

Note small, fully controlled regularity of grain size that promotes uniform corrosion, smoothest electrodeposits, less rejects.

APW EXTRUDED ANODE SECTION:



THE GREATEST ANODE DEVELOPMENT IN YEARS

APW Shaped, Extruded Anodes were developed to extend the useful life of our anodes . . . to assure uniform and consistently smooth electrodeposits . . . to minimize shedding. They accomplish these objectives for our customers day after day—and in addition, *they have helped to lower plating costs!*

The anodes are scientifically shaped to retain 80% of original surface area *after 85% by weight has been plated off!* You get longer anode life, minimized polarization and less silver scrap to be refined.

The APW Extrusion Process* assures small, uniform grain size controlled between definite, ideal limits. Corrosion is smooth, shedding is virtually eliminated, rejects are a comparative rarity.

Be certain the silver you buy in anodes is used most efficiently and economically. Our service department will be glad to develop special anode shapes to meet your particular plating bath conditions. Call or write for a representative, we'll be glad to assist with your anode problems. ★ ★ ★ ★ ★ ★

*Pat. Pending

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APW

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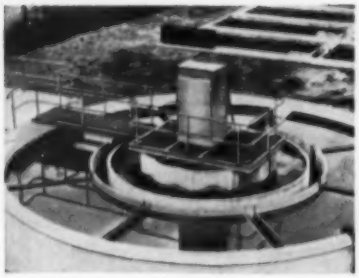

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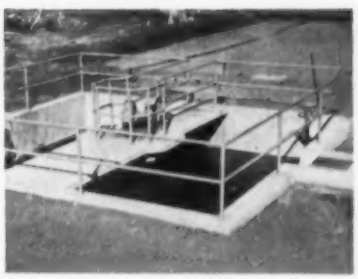

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For clarification and precipitation of toxic metals. Controlled slurry recirculation results in better treatment at higher flow rates. Custom designed skimmers available when needed.

Bulletin 850

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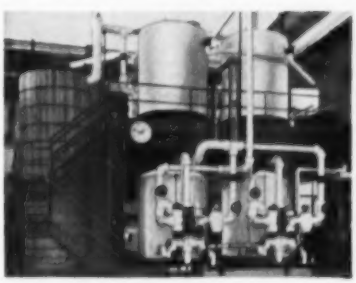
Has the Equipment!



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Bulletin 1960

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Demonstrating the same unsurpassed initiative, ingenuity and craftsmanship which, over the years, have set the pace of progress for the entire industry. Richardson-Allen engineers—working in close cooperation with Westinghouse engineers—have developed and perfected the ultimate in power rectification.

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HERMETICALLY SEALED JUNCTIONS — HIGH TEMPERATURE OPERATIONS

VERSATILITY—Richardson-Allen silicon rectifiers are now available for the plating and industrial fields in ratings up to 500 kws.

EFFICIENCY—Richardson-Allen silicon rectifier units are now supplying major industries with an unprecedented amount of direct current—with no loss in efficiency, no aging and no apparent limit to the life of the silicon junctions. Single silicon junctions are designed to withstand up to 300 vpi.

ECONOMY — Occupying unbelievable small space, the initial cost is often lower than other conversion methods; practically no maintenance is ever needed and when installation savings and power savings are figured the total amount is impressive.

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PLATING

(Advertisement)

SPECIAL REPORTS ON FINISHING NON-FERROUS METALS

NUMBER I—Decorative, Corrosion-Resistant Finishing with Iridite

Chromate conversion coatings are well known and accepted throughout industry as an economical means of providing corrosion protection, a decorative finish or a good paint base for non-ferrous metals. However, continued developments are so rapid and widespread that many manufacturers may not be completely aware of the breadth of application of this type of finish. Hence, this digest of current information; to bring you up to date on the many ways in which you can combine salable appearance with durability in one finish at a competitive price advantage. Report II on paint base, corrosion-resistant finishes and Report III on chemically polished, corrosion-resistant finishes are available on request.

First, as a basis for this discussion, a "decorative" finish is considered as any chromate film that is used as a final finish in itself. It may be truly decorative in that its sole purpose is to enhance the beauty of the product. For example, a bright chrome-like finish or a pleasing bronze appearance are among the many effects that can be obtained. It may be functionally decorative in that it reduces reflectivity for camouflage purposes or provides a means of color-coding parts. But, in all cases, the Iridite films protect the metal against corrosive attack.

Iridite finishes are now available for all commercial forms of the more commonly used non-ferrous metals, including zinc, cadmium, aluminum, magnesium, silver, copper, brass and bronze. These films can produce a wide variety of pleasing appearances. The basic colors of the Iridite coatings are grouped below by metals.

ZINC and CADMIUM: Metallic bright, light iridescent, iridescent yellow, bronze, olive drab.

COPPER, BRASS, BRONZE: Metallic bright, yellow.

ALUMINUM ALLOYS: Clear, iridescent yellow, brown.

MAGNESIUM ALLOYS: Light brown, dark brown, black.

SILVER: Metallic bright.

In addition, many films can be modified by bleaching or by dyeing. Among the dye colors available are various shades of red, yellow, green, blue or black.

Depending upon the metal and the Iridite used, corrosion resistance of clear and bright films ranges from mild passivity to as high as 500 hours in salt-spray; on heavier dark films, salt-spray resistance ranges from approximately 100 to 1000 hours.

It is this combination of decorative and corrosion resistant properties that accounts for the widening use of Iridite finishes. For example, Iridites #4-73 and #4-75 (Cast-Zinc-Brite) make possible for the first time, a combination of lustrous chemical polishing of the as-cast surface of zinc die castings and good resistance to corrosion. Further, in many cases, sizeable savings in the cost of buffing and electroplating are realized.

WHAT IS IRIDITE®?

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002" max.) gel-like, complex chromate film of a non-porous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

On many steel parts, a simple system of zinc or cadmium plate and bright Iridite is used instead of more costly electroplated finishes to provide a bright, decorative and protective finish with tremendous savings in material, equipment and labor.

In finishing aluminum, where corrosion resistance or paint adherence is the prime consideration, the aircraft industry has all but abandoned the anodizing process in favor of recently developed chromate conversion coatings, among them Iridite #14 and #14-2 (Al-Coat). These formulations and their method of application can be varied to retain the original metallic appearance while providing acceptable corrosion resistance, or to produce a fully colored brown finish that offers exceptional corrosion protection. Again, time and manpower savings are astounding—one company saved at least $15,000 a year on maintenance of racks alone and another $40,000 on materials and labor in only nine months. In addition, of course, hundreds of thousands of dollars are saved by eliminating the need for expenditures for generators, heating equipment and racks.

Iridites are widely approved under both Armed Services and industrial specifications because of performance, low cost and savings of materials and equipment.

In planning or designing, you should consider the many other characteristics of Iridite finishes which may enter into the specific problem. In addition to having decorative and protective functions, these chromate coatings form an excellent base for organic finishes and bonding compounds. They have low electrical resistance. Some can be soldered and welded. The Iridite film itself does not affect the dimensional stability of close tolerance parts.

You can see then, that with the many factors to be considered, selection of the Iridite best suited to your product requires the services of a specialist. That's why Allied maintains a staff of competent Field Engineers—to help you select the Iridite to make your installation most efficient in improving the quality of your product. You'll find your Allied Field Engineer listed under "Plating Supplies" in your classified telephone book. Or, write direct and tell us your problem. Complete literature and data, as well as sample part processing, is available. Allied Research Products, Inc., 4004-06 E. Monument Street, Baltimore 5, Maryland.

Tannery calls Merchants' Milwaukee office. A large order of assorted chemicals is needed immediately. Products of six different manufacturers are included. Can Merchants make rush delivery?

184-piece order is made up from stock at Merchants' adjoining warehouse. A large inventory is maintained to fill customers' daily needs.

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Each Merchants' office is a single, reliable source for a wide assortment of chemicals. Because stocks at Merchants' warehouses are maintained with one consideration in mind — customer service — orders for assorted chemicals are filled rapidly and completely. For 35 years Merchants Chemical has given industrial chemical users this type of specialized service. Products include acids, alkalis, fungicides, surfactants, chlorinated solvents, emulsifiers, laundry compounds, soaps, dry ice and chemical specialties.

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44TH ANNUAL CONVENTION

IN RETROSPECT

RETURNING TO MONTREAL for the first time since 1925, the American Electroplaters' Society (AES) conducted there, June 16-20, 1957, one of the most successful conventions in its 48-year history. Three of that historic city's major hotels, the Mount Royal, the Laurentian and the Windsor bulged with AES members and their families. Delegates and Alternates converged upon Montreal from Branches all over the United States and Canada, and even the Melbourne, Australia, Branch had a Delegate present.

Versatile in its bestowed benefits, this 44th Annual Convention harnessed six high-grade educational sessions; four outstanding plant visitations; a banner Ladies' program; a lauded outing into the majestic Laurentians; an enjoyed social program; an impressive opening session; a memorable banquet and two resultful business sessions of the Supreme Society, the AES's highest governing council. It created a whole that must rank high in the pantheon of AES annual assemblies.

Invocation by Dr. Frank C. Mesle launches 44th Annual Convention

Headed by G. Ross Davidson as General Chairman, the Montreal Convention's departmentized leadership included Co-Chairman Charles M. Douglas (Transportation and Outing); Mrs. G. Ross Davidson (Ladies); Philip M. Coady and Dr. John Kane (Educational); S. A. Frost (Hotel); B. T. Kelly (Banquet); William Feeley (Registration); J. T. Reisenburg Sr. (Publicity); J. T. Reisenburg Jr. (Printing); M. Cohen (Plant Visitation); B. Mendels (Finance); W. Glover (Program) and J. G. Carrique (Entertainment).

The Montreal Branch, Host Branch, and these its stalwarts who, with their industrious co-workers, engineered the success of the 44th Annual Convention merited indeed the accolades bestowed upon them not only by the nearly 1600 AES members and their families present but also by the Executive Board at its June 21 meeting. Succinctly, the Convention's chronology runs thus:

SUNDAY, JUNE 16, 1957

The Executive Board met in a full-day meeting. That same afternoon, Convention registration made an auspicious start. The evening featured the Society's traditional get-together with many present and reunion spirit high.

MONDAY, JUNE 17, 1957

"MOUNTIE" HEAD LAUNCHES CONVENTION

Nearly 700 men and women of the AES family packed the Champlain Room of Montreal's Sheraton-Mount Royal Hotel for the impressive opening session. The 44th Annual Convention was formally opened by a memorable address of welcome made, bi-lingually, by Superintendent E. Brakefield-Moore of the Royal Canadian Mounted Police.

FIRST BUSINESS SESSION, SUPREME SOCIETY

Aside from AES Branches present by proxy, a record 46 Branches were represented by some 127 Delegates and Alternates at the First Business Session of the Supreme Society that immediately followed the opening ceremonies, with President Samuel Heiman in the chair. As one element of that business meeting of the Society's supreme council, the assembly stood in traditional moment of silence in tribute to the memory of 38 members of 23 Branches who deceased during the immediately prior twelve-month period.

1956-1957 PAPER AWARD WINNERS

Dr. Abner Brenner, Paper Awards Committee Chairman, announced the winners of the Society's 1956-1957 Paper Awards, and President Heiman himself presented these awards.

Paper Award winner rewarded. Dr. Russel E. Harr receives Precious Medal Award from President Samuel Heiman as John P. Nichols, Executive Secretary, looks on

THE CARL HEUSSNER AWARD to Dr. Otto Kardos and Dr. D. Gardner Foulke, both of Hanson-Van Winkle-Munning Co.

THE GEORGE B. HOGABOOM AWARD to William M. Tucker and F. O. Beuckman, both of Eastman Kodak Co.

THE BRONZE MEDAL AWARD to W. H. Safranek and G. R. Schaer, both of the Battelle Memorial Institute.

THE ROBERT S. LEATHER AWARD to L. H. Hopewell, Fairchild Camera and Instrument Corporation.

THE CHROMIUM PLATING AWARD to Dr. V. A. Lamb and J. P. Young of the National Bureau of Standards as a result of selection by a special subcommittee of the Paper Awards Committee composed of Leslie Diveley (Chairman) and Arthur W. Logozzo and Lloyd O. Gilbert.

THE PRECIOUS MEDAL PLATING AWARD to Dr. Russel E. Harr and A. G. Cafferty, both of the Western Electric Company, Chicago.

NEW COMMITTEE REPLACEMENTS ANNOUNCED

At that same meeting, the President announced Executive Board appointment of Donald C. Austin, Chrysler Corporation; G. Ross Davidson, Canadian Hanson & Van Winkle Ltd. and Dr. Abraham M. Max of the Radio Corporation of America as new members of the Editorial Board each for a three-year term. Also announced was the Board's naming of Glade B. Bowman, Rockwell Spring and Axle Co., James D. Thomas, General Motors Co.; and Kergan Wells, W. W. Wells, Ltd. as new members of the Research Committee for respective three-year terms.

PER CAPITA TAX REFUND CHANGE STAYED

Besides the Metal Finishing Suppliers' Association (MFSA) Luncheon held in the Normandie Room and the Ladies' Luncheon that convened in Windsor Hall of the Windsor Hotel, some 35 Branch Secretaries attended the Annual Branch Secretaries' Luncheon that occurred at the Mount Royal Hotel with John P. Nichols, national executive secretary, presiding. Among other business transacted at that latter event, the assembled Branch Secretaries unanimously accepted the resolution offered by a five-man committee headed by Branch Secretary I. William Marcovitch of Philadelphia urging the Executive Board to delay making its recent per capita tax refund directive operative pending a full year's further study during 1957-1958. As a result of this recommendation, the Executive Board, at a subsequent meeting, concurred. Hence, the per capita tax refund system existent prior to the Board's directive continues in effect, unchanged, pending Board consideration at its meeting at the Cincinnati Convention next May.

NAME AND MFSA LEADERSHIP FOR 1957-1958

Meantime, the National Association of Metal Finishers that on Sunday had reelected John Palik Jr. as its president for 1957-1958, continued its two-day meeting with a well-attended Annual Educational Session. And at its own Annual Meeting, the MFSA elected M. M. Beckwith of the Harshaw Chemical Company of Cleveland as its president for 1957-1958 succeeding J. J. Duffy Jr.

FIRST EDUCATIONAL SESSION

With Cleveland F. Nixon of the General Motors Company in the chair, a "standing room only" audience heard the technical papers delivered at the Convention's first educational session that afternoon that had been prepared by B. D. Ostrow and F. I. Nobel; Dr. E. J. Seyb, A. A. Johnson and A. C. Tulumello; W. W. Sellers and C. B. Sanborn and Dr. F. A. Lowenheim. Meanwhile, the ladies enjoyed a sightseeing tour of Montreal, the Dominion's picturesque island city, and the Editorial Board, with Chairman John P. Nichols presiding, held a fruitful full afternoon's session.

EDITORIAL BOARD STARTS CINCINNATI WORK

The Editorial Board complimented its retiring members, Howard J. McAleer and Dr. Harold J. Wiesner, for excellent service during their three-year terms, then warmly welcomed its new members. It extended Board appreciation and commendation to Philip M. Coady, Host Branch Educational Chairman and to his Co-Chairman, John Kane, for top-grade cooperation in developing the 44th Annual Convention's educational program. It then launched active work upon planning and developing the educational sessions of the coming 45th Annual Convention to be held in Cincinnati in May 1958. It lauded the work in this connection already done by Robert D. Miller, Host Branch Educational Chairman, and his Cincinnati associates.

PAST PRESIDENTS ELECT PINNER

The eventful day concluded with the Annual Dinner of the Order of Past Presidents, followed by the gala, well-attended

A corner view of the gala Open House

Open House sponsored by the MFSA. Walter L. Pinner was elected head of the Past Presidents and S. S. Johnston, secretary-treasurer.

TUESDAY, JUNE 18, 1957

PUBLIC RELATIONS COMMITTEE ORGANIZED

A well-attended Research Committee breakfast was followed by a full forenoon's session of the Public Relations Committee, with Cleveland F. Nixon in the chair. The Committee not only amended and adopted its Bylaws but also elected its officers for 1957-1958. Frank Tirendi, Patent Button Company was named chairman; Robert M. Norton, Hanson-Van Winkle-Munning Co., was elected vice chairman and John P. Nichols, the Committee's permanent operating executive, continues as its secretary-treasurer.

SECOND/THIRD EDUCATIONAL SESSIONS

Dual educational sessions featured that morning's program, both drawing sizable audiences. The first, chairmanned by Walter L. Pinner, heard the technical papers of Dr. Walter Beck and Edward J. Jankowsky; Dr. M. H. Jones, Chih-Yeu-Lu and J. Zajdowski; W. Fred Stevens and L. E. Lancy and Lloyd O. Gilbert. The second, with Dr. A. West presiding, featured the technical papers of C. F. Ivins Jr.; Stanley Rich; T. J. V. Cudbird and Harold Silman.

BRANCH LIBRARIANS MEET

While a portion of the convention was being thus educationally enriched, another segment was teeing off at the Ste. Hyacinthe

Golf Club in the MFSA's Annual Golf tournament. And a large group of the AES's ladies were at Vaudreuil Inn attending the luncheon sponsored by Oakite Products, Inc. The AES's Branch Librarians, meantime, held a fruitful luncheon meeting with Francis T. Eddy, AES first vice president, in the chair. Elsewhere, another large AES group enjoyed memorable tours of the plants of the Canadian General Electric Company and of the Northern Electric Company, Ltd.

FOURTH EDUCATIONAL SESSION

Dr. H. L. Kellner presided at the packed educational session that same afternoon that heard the technical papers prepared by E. T. Candee and S. L. Henn; Howard J. McAleer and by the Chicago Branch as presented by Paul Glab. It also viewed the motion picture on industrial chrome plating by Arthur W. Logozzo.

EHRHARDT NAMED RESEARCH COMMITTEE HEAD

That same afternoon, the AES's vaunted Research Committee met in executive session and elected its 1957-1958 Officers. To succeed Chairman Arthur H. DuRose, it elected Robert A. Ehrhardt as chairman. Dr. Russel E. Harr was appointed vice chairman for Research and George E. Best was named vice chairman for Finance. The Committee warmly welcomed its new members; commended and thanked its retiring stalwarts, namely Arthur H. DuRose; Arthur P. Wrisberg and Lloyd O. Gilbert. It adopted its 1957-1958 budget—and the Executive Board, on June 21, ratified its action. Among other business, the Committee discussed plans for expanding research, for stimulating increases in the ranks of Sustaining Members, for even broader reporting of research results. The Ladies' Plato party occurred that same evening, and a packed roomful of AES ladies enjoyed a traditionally effective party with Mrs. Joan Wiarda as hostess as usual.

WEDNESDAY, JUNE 19, 1957

FIFTH EDUCATIONAL SESSION

The Executive Board met in special session that forenoon as another large audience enjoyed that morning's educational session. With Dr. Abner Brenner as chairman, the session benefited from the technical papers prepared by I. W. Wolf; J. C. Withers and P. E. Ritt and Allen E. Cahill.

He came the longest distance. Delegate Bruce A. Leslie of the Melbourne, Australia, Branch

THRILLING LAURENTIAN MOUNTAIN OUTING

Then occurred one of the most popular and satisfying events of the 44th Annual Convention's program, namely the well-conducted and highly pleasing outing into the thrilling Laurentian Mountains. Many enthusiastic reports held this to be the "piece de resistance" of a generally excellent annual convention.

And that same evening, "standing room only" audiences enjoyed high quality floor shows in two of the Mount Royal's spacious ballrooms. These, in turn, were followed by dancing in both rooms until the next morning's wee hours.

THURSDAY, JUNE 20, 1957

SIXTH EDUCATIONAL SESSION

The sixth and final educational session took place this forenoon before a sizable audience with Ralph E. Schaefer in the chair. It heard the papers of Roy C. Spooner, J. M. Andrus, R. F. Ledford and Walter E. Pocock.

Meantime, the ladies journeyed to St. Helen's Island and enjoyed luncheon at the noted Helene de Champlain Restaurant under the sponsorship of the Udylite Corporation. Another AES group not only visited the hospitable plant of the

A typical Educational Session at the Montreal Convention

Canadian Pratt and Whitney Aircraft Company, Ltd. but also toured the impressive plant of Canadair, Ltd. For some 110 Branch Delegates and Alternates, however, there was a hardworking, full day's important session of the Supreme Society, the AES's governing council.

SECOND BUSINESS SESSION, SUPREME SOCIETY

A dozen Past Presidents answered the Roll Call as Branch Delegates, including:

Frederick Fulforth	William J. Neill
Ellsworth T. Candee	Cleveland F. Nixon
George J. Wagner	Franklyn J. MacStoker
Walter L. Pinner	George P. Swift
S. S. Johnston	Ralph E. Schaefer
Arthur W. Logozzo	Clyde Kelly

1957-1958 PLATING/SOCIETY BUDGET APPROVED

The Supreme Society approved the certified audit statement for the fiscal year 1956-1957 submitted by the certified public accounting firm of Clyde A. Zukswert & Co. of Newark, N. J., then accepted the consolidated Society/PLATING budget for 1957-1958 presented by the Executive Board. The approved budget estimates consolidated income for 1957-1958 aggregating $225,675.00 and budgets consolidated expenses totaling $225,675.00

As winners of the Society's membership increase competition in their respective classes for the fiscal year ended March 31,

(1) Winners of the 1956–1957 Paper Awards, left to right, Dr. Vernon A. Lamb, Glen R. Schaer, William H. Safranek, William M. Tucker, Frank O. Bueckman, Dr. D. Gardner Foulke, Dr. Otto Kardos. Dr. Russel E. Harr is shown on page 891 receiving his award. (2) Montreal Convention General Chairman G. Ross Davidson. (3) The Branch Secretaries' Luncheon. (4) A group view at the Past Presidents' Dinner. (5) Dais at the Public Relations Committee meeting. Right, Cleveland F. Nixon, chairman; left, PLATING Editor, Rodney Leeds, acting secretary. (6) The Editorial Board starts work in Montreal on 1958 Cincinnati Convention Educational Sessions. (7) The Branch Librarians' Luncheon. (8) The busy dais at the Second Business Session of the Supreme Society. Left to right, Clyde Kelly, Ralph D. Wysong, John P. Nichols, Dr. Samuel Heiman, Francis T. Eddy, Herberth E. Head. (9) The busy Research Committee in full-afternoon session with Chairman, Robert A. Ehrhardt presiding. (10) A dozen Past Presidents answered the Supreme Society roll call among them, left to right, Dr. George Swift, Franklyn MacStocker, George J. Wagner, Ellsworth T. Candee, William J. Neill, Frederick Fulforth, Cleveland F. Nixon. (11) Newark Branch wins First Division prize for membership growth in 1956–1957. Herberth E. Head, membership chairman, hands the prize to Dr. W. Andrew Wesley, Newark representative. Others similarly cited included the St. Joseph Valley Branch (Second Division) and the Mississippi Valley Branch (Third Division). (12) Election Committee posts a narrow victory for Dr. W. Andrew Wesley over George E. Cavanaugh for the third vice presidency.

1957, the Newark Branch (First Division); St. Joseph Valley Branch (Second Division) and Mississippi Valley Branch (Third Division) each were awarded $50 prizes. The presentations were made by Herberth E. Head, second vice president in charge of membership promotion.

NICHOLS' REPORT RECEIVED WITH THANKS

In conformity with the Milwaukee Branch resolution adopted by the Supreme Society at its meeting in Washington, D.C., June 21, 1956, instructing the Executive Board, "to appoint or hire competent people to examine the structure, effectiveness and services of the Society and its related publishing activities and to report, with recommendations, to the Supreme Society at the convention in 1957", the instant Supreme Society assembly attentively heard the comprehensive final report as to National Headquarters and PLATING magazine made by John P. Nichols. A management and publishing practitioner of long standing, Mr. Nichols had conducted the year-long study by appointment of the Executive Board. The Supreme Society received the Nichols' report with thanks, then referred it to the Executive Board for consideration and action.

STRUCTURE OF SOCIETY REPORT RECEIVED

The Supreme Society also received and referred to the Executive Board, a report from the "Structure of the Society Committee", a nine-man supplementary committee headed by Leonard P. Weeg, appointed after the Interim Meeting in 1957 for the purpose of studying the broad framework of the overall Society and of reporting and recommending any structural changes needed by the AES to attain its even greater future.

The report's major conclusions held, in effect:

1. That the structure of the Society is basically sound—that no basic changes are recommended—that the Society can cope with its future by even better performance by the Supreme Society and the Executive Board.
2. That it noted increasing trend toward voluntary regional Delegate meetings for the purpose of discussing Supreme Society business. It urged encouraging the development of this worthy trend.
3. That the Interim Meeting be held annually at a time and place selected by the Supreme Society at the Annual Meeting.
4. That the current "Structure of the Society" Committee be replaced by a permanent committee on long range planning, said new committee to be composed of nine members, each serving a three-year term, selected on a staggered basis by the Supreme Society itself.

SCIENTIFIC ACHIEVEMENT AWARD ESTABLISHED

By unanimous action, the Supreme Society accepted the report of a special presidential committee headed by Past President Kenneth M. Huston thereby instituting a so-called "American Electroplaters' Society Scientific Achievement Award". The new AES Award's purpose is to recognize Society members whose outstanding contributions have advanced the theory and practice of electroplating, metal finishing and allied arts; have raised the quality of processes and products; or have enhanced the dignity and status of the profession. The winner to be selected and announced by a "Scientific Achievement Award Committee" at the Cincinnati Convention in 1958 will deliver "The William Blum Lecture" at the Detroit Convention in 1959.

Any such selected lecturer (award winner) must be a member of the Society with at least ten years of recognized achievements related to the Award. His cash honorarium will be $500 plus a suitably inscribed scroll. His lecture will be published in the book, "Technical Proceedings", covering that convention during which the lecture will be delivered. A list of the "William Blum Lecturers" and the subjects presented thereby will be cumulatively published annually in "Technical Proceedings."

AES's NEW PAPER AWARDS SYSTEM

At that same meeting, the Supreme Society also adopted a report reconstructing the Society's Paper Award system prepared by an Editorial Board "Paper Awards Appraisal Committee" led by Past President Arthur W. Logozzo, then

Mrs. Florence Marquardt, convention reporter, as she looked at her 21st AES convention

channeled to the Supreme Society by the Executive Board. Effective in 1958, as a result, the Society's Paper Awards will be:

1. THE CARL E. HEUSSNER AWARD AES GOLD MEDAL. Co-sponsored by the AES and the United Platers' Foundation (Glen H. Friedt, trustee), it will be the top prize for the best PLATING or convention paper of the fiscal year. Cash award $250.
2. THE AES SILVER MEDAL for the second best PLATING or convention paper. Cash award $150.
3. THE AES BRONZE MEDAL for the third best PLATING or convention paper for the fiscal year. Cash award $50.
4. THE GEORGE B. HOGABOOM AWARD for the best paper on nickel plating during the fiscal year. Cash award $75 and a certificate. Co-sponsored by the AES and the Hartford Branch.
5. THE ROBERT S. LEATHER AWARD for the best contribution to the knowledge and art of mechanical finishing. Cash award $50 and a certificate. Co-sponsored by the AES and the Lea Manufacturing Company.

(1) Retiring Past President Clyde Kelly receives his Past President's plaque from retiring President Heiman. (2) Incoming President Francis T. Eddy presents Past President's plaque to retiring President Samuel Heiman. (3) A standing Supreme Society ovation for retiring Past President Clyde Kelly. (4) Past President Ralph A. Schaefer being presented with his Past President's plaque by Dr. Heiman. (5) The AES congratulates and thanks the Montreal Branch and both staff and line of its industrious Convention Committee. Above General Chairman G. Ross Davidson and Mrs. Davidson, ladies' chairman, accept the Society's plaudits in behalf of their associates. (6) Unable to be present at the First Business Session of the Supreme Society, L. H. Hopewell, left, belatedly receives his Robert S. Leather Award from John P. Nichols, executive secretary. (7) Officers of the Society's newest Branch, the temporarily chartered Mohawk Valley Branch. Left to right: Jack Bension, Branch vice president, Francis A. Czech, Branch president, Charles Raehm Jr., Branch secretary-treasurer. (8) Convention Educational Chairman Philip M. Coady, Co-Chairman Dr. John Kane, and Mrs. Coady. (9) A quartet of Montreal convention workers: Program Chairman William Glover, James Rennie, James Saimoto, John Moreau. (10) Business meeting of the Supreme Society in full session. (11) The Ladies' Plato Party. (12) Attentive members at one of the Educational Sessions.

6. THE CHROMIUM PLATING AWARD for the best paper on the subject of chromium plating. Cash award $50 and a certificate. Co-sponsored by the AES and the Nutmeg Chrome Corporation.
7. THE PRECIOUS METAL PLATING AWARD for the best paper on the plating of gold, rhodium, platinum, palladium and silver. Cash award $50 and a certificate. Co-sponsored by the AES and Technic, Inc.
8. THE JOHN J. HANNEY MEMORIAL AWARD. Expectedly, the details of this award will shortly be finalized, then announced in a subsequent issue of PLATING.
9. AES AUTHOR. This certificate will be given to each author of a PLATING or convention paper published or delivered.

PER CAPITA TAX INCREASE PROPOSAL FAILS

The proposed Constitutional amendment increasing annual per capita taxes payable by respective Branches to the Supreme Society from $5.70 per member to $7.70 per member received the favorable vote of the majority of Delegates present at the meeting but missed enactment as a Constitutional amendment because it failed to receive the necessary two-thirds vote of all 168 Delegates as provided by Part III, Article I, Section I of the AES Constitution. Hence the proposal died.

Dr. Samuel Heiman, retiring President, presents the traditional silver gavel to incoming President Francis T. Eddy

MAJOR CONSTITUTIONAL/BYLAW AMENDMENTS PASSED

The following principal Constitutional and Bylaw amendments were, however, enacted.

1. The Society's fiscal year was changed to the twelve-month period from July 1 through the following June 30.
2. Minutes of each meeting of the Supreme Society will be sent to each Delegate and Alternate and to each Branch President and Branch Secretary.
3. Membership promotion responsibility was deleted from the portfolio of the Second Vice President and instead vested in a Membership Committee composed of nine members and the Second Vice President, a standing committee with its personnel (except the Second Vice President) serving respective three-year terms on a staggered basis.

The 1957-1958 Executive Board impressively installed by Past President Walter L. Pinner. Left to right, Francis T. Eddy, Herberth E. Head, Ralph D. Wysong, Dr. W. Andrew Wesley, Dr. Samuel Heiman

4. The First Vice President was relieved of the responsibility of the educational program and that responsibility was instead vested in an Educational Committee composed of nine members and the First Vice President, a standing committee with its members (except the First Vice President) each serving a three-year term on a staggered basis.
5. The Public Relations Committee shall consist of nine members and the Executive Secretary who shall be a permanent member. The other nine members will serve three-year terms on a staggered basis.
6. The Publications Committee which shall collect and review all material published by the Society to determine that which shall be published in book form, shall consist of nine members and the President. Each of the nine members shall serve three-year terms on a staggered basis.
7. The Exhibit Awards Committee which shall supervise and judge plating exhibits submitted by Branches and/or individual members of the Society at Annual Meetings shall consist of nine members and the Third Vice President. Each of the nine members shall serve three-year terms on a staggered basis.
8. There shall be an annual Interim Meeting of the Supreme Society at a time and place selected by the Supreme Society for the purpose of hearing reports and proposals, of considering all matters referred to it by the Annual Meeting, and of making recommendations to the Annual Meeting and the Executive Board concerning these and other matters which may come before it. No action of any Interim Meeting shall be binding to the Society.
9. The Law Committee shall examine all new rules and laws of the several Branches and Standing Committees, and any amendments thereof, for inconsistencies with the laws of the Society, and shall approve those found free of such inconsistencies.
10. Branch Delegates and Alternates shall be elected so as to take office at the first Branch meeting following the Annual Meeting of the Supreme Society. The Branch President and Branch Secretary shall certify and submit the names of Delegates and Alternates to the Executive Secretary so as to reach him by not later than the first Monday in November. Delegates and Alternates, immediately upon accreditization, shall be provided with a booklet by the Executive Secretary describing the duties of Delegates. This booklet to be printed by the Na-

tional Office shall contain that section of duties of Delegates from the Branch Officers' Manual.

11. The Scientific Award Committee which shall select the "William Blum Lecturer" shall consist of six members each serving three-year terms on a staggered basis. After the first appointments, the Executive Board shall select two such members each year.

First meeting of the new Executive Board. Left to right, Ralph D. Wysong, Dr. Samuel Heiman, Francis T. Eddy, John P. Nichols, Herberth E. Head, Dr. W. Andrew Wesley

In keeping with the Society's improvement of its media recognizing meritorious service to the Society, handsome new plaques were presented to the AES's two most recent Presidents, namely Ralph E. Schaefer and Clyde Kelly. Hereafter, a similar plaque will be presented to each outgoing President.

FRANCIS T. EDDY ELECTED PRESIDENT

In the annual elections that then followed, Francis T. Eddy, president of the Technicraft Laboratories, Inc. of Thomaston, Connecticut, was unanimously elected national president of the AES succeeding Dr. Samuel Heiman of Philadelphia, Pennsylvania.

Herberth E. Head of the Chrysler Corporation, Detroit, was elected first vice president and Ralph D. Wysong, Studebaker-Packard Corporation was voted second vice president.

DR. W. A. WESLEY, NEW THIRD VICE PRESIDENT

In a close contest, Dr. W. Andrew Wesley, manager, Research Laboratory, International Nickel Co., Inc., prevailed over George W. Cavanaugh of the General Electric Company and was elected third vice president.

These AES officers for 1957-1958 were impressively installed by Past President Walter L. Pinner. The traditional solid silver gavel was presented to President Eddy by Past President Heiman. The latter was then presented with his plaque and his shining new gold Past President lapel button by his successor. Past President Clyde Kelly, retiring from the Board, was extended a standing ovation by the assembled Supreme Society.

BOSTON BRANCH AWARDED 1961 CONVENTION

The Boston Branch was unanimously awarded the 1961 Annual Convention—and Chicago was named by the Executive Board as the 1962 Exposition City with several Mid-Western Branches spearheading as co-sponsoring Branches, including Chicago, Rockford, St. Joseph Valley, Mississippi Valley, Milwaukee and others. The Supreme Society vested authority in the Executive Board to name the place and date of the 1958 Interim Meeting. Following Board invitation to Branches to vie for Interim Meeting sponsorship, the Board expectedly will make its decision at its September meeting.

GALA BANQUET ENDS MONTREAL CONVENTION

The 44th Annual Convention ended that same evening with an impressive banquet and dance. A colorful feature was the march into the banquet hall of National Officers, the Convention General Chairman and others occupying the dais, led and piped in by a bagpiper in conformity with Canadian protocol. These, including their wives, were appropriately introduced after the entire assembly had stood at attention as the orchestra rendered the national anthems of the United States and Canada. The Montreal Branch and its able and industrious Convention Committee were glowingly complimented for a noteworthy convention by a well-received Resolution of Commendation presented by Manson Glover in behalf of the assembled AES.

On this note, the 44th Annual Convention passed into posterity. Attention now therefore focuses upon the 45th Annual Convention to be held in Cincinnati, May 19-22, 1958. "The King is dead. Long live the King."

A view of the splendid banquet that concluded the memorable 44th Annual Convention in Montreal, so-called Paris of the New World

MONTREAL CONVENTION and the AES's Ladies

by Frances M. Hoffman
(Mrs. August R.)
Cleveland, Ohio

Hello Ladies!

Once again, we want to review the best convention in 1957. The ladies who were privileged to attend the convention in Montreal, will find it refreshing to relive the Ladies' Program. The ladies who were not able to be with us will get a bird's-eye view of the capabilities, loveliness and graciousness of the Montreal ladies under the direction of Mrs. G. R. Davidson.

The Get-Together Party on Sunday night was a most pleasant affair. The Champlain room was a scene of friendly greetings—and some very "chummy." The "Early Birds" come earlier each year so they can be on deck very early and be one of the first to say, "so nice to see you!" Last but not least, the refreshments gave us extra strength to shake hands. One always finds it a thrill to spot people after twelve months of only memories. When the convention committee first planned a Sunday night activity, it was because they felt they wanted to entertain the people who just "happened" to arrive early. This is no longer true. The conventioneers now actually plan to arrive in time to participate in the Sunday night party.

The Opening Session on Monday morning was interesting as well as educational. The keynote address was delivered by Superintendent E. Brakefield-Moore, distinguished superintendent of the Royal Canadian Mounted Police. The ladies find this session very valuable.

The Get-Acquainted-and-Renew-Acquaintance Luncheon on Monday Noon was filled with delicious food and much "chatter." We ate at the Windsor Hotel's Windsor Hall, the ballroom used to entertain royalty. Many "Ah's" and "Oh's" were ringing in this lovely ballroom as door prizes found their way to lucky winners. The lovely feast was followed by a bus tour of Montreal. Everyone reported a delightful trip. Monday night we all enjoyed the Metal Finishing Suppliers' Association Open House, for, as usual, it was filled with music, laughter—and ample "yummy" food, topped with "cool" refreshing drinks. The orchestra was "peppy" and everyone had a perfect evening of fun. How grateful we are to the MFSA!

The Aunt Ella Society Luncheon took place on Tuesday in Vaudreuil Inn on the Ottawa River. Each year the ladies look forward to this traditional party sponsored by Oakite Products, Inc. Having Mr. David X. Clarin as our host, is truly a privilege and Dave always makes the setting complete. Many thanks to Oakite for a delightful time. Altho Dave Clarin was not feeling up to par, the ladies passed a unanimous vote to hope and pray that next year he will be feeling better. "We need you, hear Dave?" Tuesday night, Mrs. Joan T. Wiarda was again the gracious hostess for the Plato Party, sponsored by the MFSA. Many beautiful prizes followed the exclamations "Plato!" The prizes were carefully selected and were treasured by the lucky winners. In addition, each lady walked away clutching proudly a lovely cup and saucer, selected and presented by the ladies of Montreal.

Wednesday, the ladies joined the men for two outstanding social functions of the convention. Firstly, the Laurentian Outing and Buffet Lunch. This was truly a gala affair. The ride was pleasant, the club served superb food and everyone had a jolly time. Much excitement filled the grounds everywhere. Just relaxing was a very popular activity. The goats grazing on the roof were most entertaining. Secondly, the Floor Show and Dance which completed a delightful day.

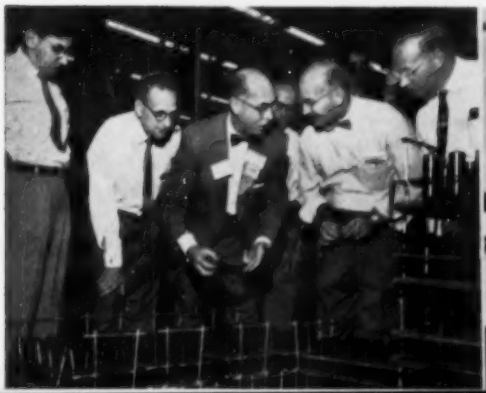
Thursday was another day filled with fun and adventure. We journeyed to Helene de Champlain Restaurant on St. Helen's Island in the St. Lawrence River. A "luscious" luncheon was served in this unique atmosphere. This lovely project was sponsored by the Udylite Corporation, with Mr. Robert Trees as our perfect host. Dr. Richard Saltonstall was again our speaker. In a very efficient way, "Doc" is educating the women in the plating field. This time, he gave us a very informative talk on anodizing together with films. Now we know how our pastel salad bowls came into existence. The educational session is always a "must" and the ladies find it important. Then too, the ladies received beautiful orchids from the Rapid Electric Co. These were displayed at the banquet Thursday night and truly, they brought much pleasure to the ladies and added color to the banquet. The Annual Banquet Thursday evening was again "a night to remember." The music, tasty dinner and prizes together with all the "jolly" people made this party a fitting climax for the 44th AES Convention.

This completed a well planned and ably executed convention in the beautiful city of Montreal and we can assure you that the ladies declare this to be the best convention in 1957.

Our lovely and charming chairman, Mrs. G. R. Davidson, and her able committee demonstrated all qualities of perfect hostesses. In every instance, they were most anxious to please us and make us comfortable. No job seemed too difficult for them to undertake and meet it successfully. The ladies who attended the convention were fully aware of the hard work which was woven into all the activities. We appreciate the untiring efforts which spelled success. Again, in behalf of all the ladies who attended the convention, may I extend to Mrs. Davidson and her committee a very sincere "Thank You" and may it be resolved that their friendliness, hospitality, graciousness and efforts be remembered as an important part of the 44th Annual AES convention, which was superb and fun for all of us.

'Bye Now! Another Jolly Re-union in Cincinnati!

Visitation day at the Canadian Pratt and Whitney Aircraft plant during the Montreal Convention. (Left) William Glover, wearing coat, does some intricate explaining. (Center) Exhibit of electroplated parts. (Right) Inspecting a few of the tanks.



AES NEWS

Ralph D. Wysong

Wysong Receives New Appointment

Recently appointed Manager of Manufacturing Research, Studebaker-Packard Corporation, is Ralph D. Wysong, second vice president of the AES. He was formerly chemical engineer in charge of finishes of the Studebaker Division.

A resident of South Bend, Indiana, Mr. Wysong was graduated in Chemical Engineering from Purdue University in 1923. He is a registered professional engineer.

A member of the Society for many years, Mr. Wysong, among other distinctions, has served as president of the St. Joseph Valley Branch and has been a Branch Delegate to all AES National Conventions since 1943. He is a current member of the Boy Scout Council Executive Board.

W. A. Pinner

S. S. Johnston

To its highest post, the AES's Order of Past Presidents elected Past President Walter L. Pinner of Houdaille Industries, Inc. as president for 1957-1958 at the recent Montreal meeting of the Order. Past President Samuel S. Johnston was named secretary-treasurer. Dr. Samuel Heiman, AES president in 1956-1957, is of course, the Order's most recent new member.

R. A. Ehrhardt

Dr. R. E. Harr

G. E. Best

Elected at the recent Montreal Meeting, the Research Committee's leadership for 1957-1958 includes Robert A. Ehrhardt, Bell Telephone Laboratories, Inc., chairman; Dr. Russel E. Harr, Western Electric Co., vice chairman (Research) and George E. Best, Allied Chemical & Dye Corp., vice chairman (Finance).

Virginia-No. Carolina Platers Choose Name

The June 28, 1957 meeting of the electroplater's of the southern Virginia and northern North Carolina section was held at Virginia Polytechnic Institute, Blacksburg, Virginia. Twenty-two platers faced the bad weather resulting from hurricane Audrey, enjoyed a steak dinner at the Faculty Dining Room, and participated in the meeting following.

The group agreed to adopt the name "Blue Ridge Section," avoiding local connections since the group covers a wide territory. T. R. Boggess was elected temporary chairman and N. F. Murphy as acting secretary. A nominating committee consisting of Bruce Wallace, Carl Witherspoon, and C. S. Harper were elected to present a slate of regular officers at the next meeting. N. F. Murphy reported on progress of the application for temporary charter.

Paul Johnson, field engineer for the G. S. Blakeslee Co. discussed the varieties of machines which have been developed for cleaning and degreasing and J. J. Maquire, technical representative for the Branson Ultrasonic Corp. answered questions on the applications of ultrasonic energy to cleaning and degreasing.

NATIONAL HEADQUARTERS PERSONNEL

Mrs. Diana Davis

Bringing a broad business background to her position as Secretary to the Executive Secretary, Mrs. Davis is a native Chicagoan and an alumna of the University of Iowa.

INVITATION TO BRANCHES TO HOST FIFTH INTERIM MEETING

At its recent meeting in Montreal, the Supreme Society, AES's highest governing council, vested authority in the Executive Board to select the place and date of the Society's Fifth Interim Meeting, to be held in January 1958.

Accordingly, any conveniently located, moderate-size or small AES Branch desiring to serve as Host Branch of this Fifth Interim Meeting is urged to submit its invitation forthwith and, in any case, by not later than September 1, 1957. Send it to John P. Nichols, Executive Secretary, American Electroplaters' Society, 445 Broad Street, Newark 2, N. J.

The Executive Board will make its selection and set the date at its September meeting. PLATING will announce both in the issue immediately following Board decision.

AES NEWS

Dr. William Blum Lecture Established

At its recent Montreal meeting, the Supreme Society accepted the report of a special presidential committee and established a so-called "AES Scientific Achievement Award" so as to recognize outstanding scientific achievement by Society members. Annually hereafter, as a result, an award winner selected by a "Scientific Achievement Award Committee" will deliver the "William Blum Lecture" at the annual convention. He will receive not only a $500 cash honorarium but also a suitably inscribed scroll. The lecture will be published in "Technical Proceedings." Above Dr. William Blum whose name will honor the Lecture. Through his active association with AES technical programs over the years, Dr. Blum has indeed contributed greatly in gaining international recognition for the Society as a forum for discussion of theoretical and practical aspects of electroplating.

Dr. William Blum

PAST PRESIDENT'S PLAQUE

The handsome plaque above is the Society's new award given to retiring National Presidents upon completion of their tenures. Suitably inscribed, such plaques were presented at the recent Montreal meeting of the Supreme Society to Past Presidents Ralph E. Schaefer (1954-1955), Clyde Kelly (1955-1956) and Dr. Samuel Heiman (1956-1957).

R. D. Miller

Charles Wise

E. A. Blount

Cincinnati Branch Prepares for 1958 Convention

With the curtain now drawn upon the outstanding 44th Annual Convention held in Montreal, attention now focuses upon the 45th Annual Convention that will occur in Cincinnati, Ohio, May 19-22, 1958 at the Sheraton-Gibson Hotel of that interesting city. That convention's command staff is headed by Charles Wise of the Buckeye Products Company as General Convention Chairman with Ezra Blount, editor of "Products Finishing" magazine as co-chairman. Collaborating with the Editorial Board in developing a noteworthy program of Educational Sessions is Robert D. Miller, Host Branch Educational Chairman. As an aside, the AES's "Golden Jubilee Convention and International Exposition" will occur in Detroit in 1959 with that dynamic Branch as host. In 1960, the Annual Convention site will be Los Angeles—then Boston in 1961—then Chicago in 1962.

COURSES IN ELECTROPLATING

City	School	Instructor	Tuition Fee Per Semester	Course Length
British Columbia	—	Walter Kellerman David Titmouse		12 wks.
Brooklyn, N.Y.	Brooklyn Evening Tech. High School	Louis Serota	None	18 wks.
Chicago, Ill.	Illinois Institute of Technology	J. M. Andrus	$80	18 wks.
Cleveland	John Jay High School	S. L. Jackson J. A. Zehnder	$ 6	8 wks.
Detroit	Mumford High School	John Strandburg	$ 5	5 wks.
Indianapolis	Purdue University Extension	Dr. A. M. Max	$45	16 wks.
Los Angeles, Cal.	University of Calif. Extension Division	M. Raskin	$27	18 wks.
New Haven	New Haven College	E. F. Foley, Jr.	$50	15 wks.
Newark	Various Plants and Laboratories	Gus Bittrich	$20	11 wks.
Philadelphia, Pa.	Temple University Tech. Institute	Dr. S. Heiman	$35	16 wks.
Providence-Attleboro	Central Senior High School	Omer Jette J. Fogarty J. Castriotta	None	2 yrs.
St. Joseph Valley	—	Dr. H. J. Wiesner	—	—
St. Louis	Hadley Technical High School	Dr. Otto C. Klein	$ 9	16 wks.
San Antonio	Trinity University	W. P. Wisdom	$10	18 wks.
San Francisco	John O'Connell Tech. H. S. Palo Alto High Sch. Palo Alto, Cal.	Horace Smith J. A. Pope	— —	— —
Toronto, Canada	Central Technical High School	A. R. Moores	$15-non-res. $ 5-city res.	24 wks.
Stroudsburg, Pa.	Jos. B. Kushner Electroplating School, 115 Broad Street (Corresp. Course)	Jos. B. Kushner	$150	4 mos. to 1 yr.

The above listings were correct so far as could be ascertained at press time. Prospective students are urged to verify courses prior to making definite plans.

National Association of Metal Finishers Executive Committee following the annual election June 16, at Sheraton-Mount Royal Hotel, Montreal. Elected for the 1957–58 term were, left to right, Harold W. Baker, first vice president; Frank Kaiser, secretary-treasurer; John Palik Jr., president; Webster B. Knight, second vice president; and Sal Novelli, assistant secretary-treasurer.

Palik Reelected NAMF President

The annual convention of the National Association of Metal Finishers, June 16 and 17, at Montreal's Sheraton-Mount Royal Hotel, was attended by nearly 300 persons. The conclave featured a day-long business meeting, management seminar, reception and banquet. Arrangements were under the direction of the general convention chairman, Harold W. Baker, Electro Galvanizing Co., Chicago.

Eight of 14 members of the 1957–58 board of directors were reelected to the NAMF's top policy-making body. Reelected were John Palik Jr., National Plating Corp., Cleveland, president; Harold W. Baker, Electro Galvanizing Co., Chicago, 1st vice president; Webster B. Knight, Knight Plating Co., Detroit, 2nd vice president; Frank Kaiser, Long Island Mechanical Plating Co., Woodside, L. I., N. Y., secretary-treasurer; Sal Novelli, Service Plating Co., Brooklyn, N. Y., assistant secretary-treasurer; and directors Philip Ritzenthaler, Plating Engineering Co., West Hills, Wisconsin; Henry J. Siegel, Siegal-Robert Plating Co., St. Louis, Mo.; Mariano Ranno, Imperial Plating Co., Brooklyn, N. Y.; Joseph Eisenberg, Almag Chemical Corp., Baltimore, Md.

Newcomers to the board of directors include Harold E. Coombes, Crown City Plating Co., Pasadena, Calif.; George W. Taylor, Production Plating Co., Adel, Ga.; Edward Fell, Atlas Plating Works, Cicero, Ill.; Ernest D. Callahan, F. M. Callahan & Son, Inc., Malden, Mass.; and Curtis M. Varland, Varland Metal Service, Inc., Cincinnati, Ohio.

Committee Chairmen Appointments

Following his reelection, President Palik made the following appointments: Con-

"WELL WORTH THE FEE"

"The course is well worth the fee you are asking; The know how of plating is so thoroughly explained that even the 'hard to explain to' type of worker can understand it. I have enjoyed each and every lesson. Once again, please accept my thanks," writes plating foreman L. J. Melvin of the Lincoln Engineering Co., St. Louis, Mo. You will thank me too! Write JOSEPH B. KUSHNER, ELECTROPLATING SCHOOL, 115 Broad Street, Stroudsburg 40P, Pa.

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stitutional Revisions, J. Robert Greenwell, Reliable Plating Co., Chicago; Standards and Definitions, Philip Ritzenthaler; Strategic Materials Committee, Mariano Ranno; Educational, Henry J. Siegel; Parliamentarian, Atty. G. David Zeile Jr., Ashman and Zeile, Cleveland.

Wilson Loveless, Varland Metal Service, Inc., Cincinnati, was named 1958 general convention chairman by Palik. As in the case of other chairmen, Loveless will choose his own committeemen.

Eulogy to Taormina

Alfred Marinaro, Platers' Research, Inc., New York, close friend and business associate of Silvio C. Taormina delivered a fitting eulogy to the deceased champion of the job plater which was made part of the record of the 1957 NAMF convention proceedings. Members stood in silent tribute following the presentation.

In eulogizing Mr. Taormina, Mr. Marinaro said in part:

"The untimely death of Silvio C. Taormina on June 8, 1957 brought to a close one of the most colorful careers of our industry.

"His early employment in the various facets of industry, finally brought him in contact with the electroplating and metal finishing industry, which fired his imagination and became his chosen field. While employed at U.S. Research in Long Island City, he became associated with Dr. L. C. Pan, one of the eminent electrochemists of the time. With his quick mind and desire to learn, Silvio acquired a wealth of knowledge and experience that laid the technical foundation for organization of the consulting firm of Platers Technical Service Inc., in 1937.

"Those who were fortunate enough to know him personally could not help but be impressed by his positive views, progressive policies and insight of human nature.

"When he was chosen as executive secretary of the Masters' Electro-Plating Association in 1951, he immediately devoted his time to reviving interest and activity in the National organization.

"The industry has lost a friend and a champion, and he left a void in the hearts of his host of friends and associates."

Business Meeting

The 8-hour business session saw the enactment of legislation permitting membership to firms outside of the U.S., the creation of the post of past president, change in disbursement procedures, and the presentation of reports from various officers and committeemen.

Management Seminar

Highlight of the convention was a give-and-take discussion by panelists representing a cross section of U.S. job platers. Described by many as "one of the most illuminating and interesting educational sessions ever to have been presented," the seminar was moderated by A. T. Leonard, Superior Plating Inc., Minneapolis, Minn. The topic was "Determining the Cost of Certain Still, Decorative and Barrel Plating Jobs."

Panelists included Mariano Ranno, Henry J. Siegel, L. T. Briggs Jr., Lawrence J. Hay, and Glenn H. Friedt Jr.

The reception and banquet on Monday evening concluded the 1957 NAMF convention program with A. C. Wilkinson, sales promotion manager, Electro Lux of Canada, Ltd., delivering the main address. His subject, "The Fitly Spoken Word," was informative and entertaining.

Honored guests at the reception and banquet included Dr. and Mrs. Samuel Heiman, American Electroplaters' Society; Mr. and Mrs. Joseph J. Duffy Jr., Metal Finishing Suppliers' Association; and Mr. and Mrs. G. Ross Davidson, Montreal Convention chairmen.

Next year's NAMF Convention is scheduled for May 18 and 19 at the Sheraton-Gibson Hotel, Cincinnati, Ohio.

Mendizza and Compton Win Award

K. G. Compton and A. Mendizza of the mechanical staff, Bell Telephone Labora-

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COMPOUNDS MADE IN BAR, SPRAY OR PASTE

tories, Murray Hill, N. J., were honored June 19 during the 60th Annual Meeting of the American Society for Testing Materials at Atlantic City by receiving the Sam Tour Award for their paper on "Galvanic Couple Corrosion Studies by means of the Threaded Bolt and Nut Wire Test" which was published in the 1955 ASTM Proceedings. The award was established to encourage research on the improvements and evaluation of corrosion testing methods and to stimulate technical papers in this field.

As a research electrochemist, Mr. Compton has been associated with the Bell Telephone Laboratories for the past 28 years. His interests have encompassed such diverse subjects as storage batteries, electrolytic condensers, corrosion, electroplating, paint, adhesives, wood preservation and electrical devices.

He has been active in the ASTM for many years and is currently chairman of the Advisory Committee on Corrosion and Committee B-3 on the Corrosion of Non-Ferrous Metals. He has published many papers on corrosion, protective coatings, and materials deterioration.

He is a member of the National Association of Corrosion Engineers, the Electrochemical Society, and the AES.

Mr. Mendizza has been associated with the Bell Telephone Laboratories for 29 years. His work has been concerned chiefly with general corrosion problems and with the engineering of metallic finishes for the telephone plant.

He is the author and co-author of several papers on various phases of corrosion prevention and accelerated testing procedures. Beside his activities in ASTM committees, he devotes time to AES research projects. He is also a member of the National Association of Corrosion Engineers and the Electrochemical Society.

Corrosion Engineers Have New Section in Canada

A new section of the National Association of Corrosion Engineers has been organized at Calgary, Alberta Province, Canada. It is the sixth NACE local organization in the Dominion and the fifty-third in the association.

The National Association of Corrosion Engineers, a 5000-member organization, consists of individuals and companies interested in corrosion control methods, materials and processes.

MFSA Elects Beckwith 1957-1958 President

The Sheraton-Mount Royal Hotel in Montreal was the scene of the annual convention of the Metal Finishing Suppliers' Association from June 16 to 18.

The Board of Trustees met on the afternoon of the opening day. On Monday, June 17, the luncheon and annual meeting were held. That same evening, both ballrooms on the ninth floor of the hotel were crowded for the MFSA Open House. The golf tournament on Tuesday climaxed the successful convention.

Thirty new members were added during the past year bringing the total membership to 184 concerns.

The MFSA Board of Trustees for 1957–1958, elected at the convention, is as follows: M. M. Beckwith, The Harshaw Chemical Co., president; E. W. Couch, The Lea Manufacturing Co., 1st vice president; R. F. Ledford, Industrial Filter and Pump Mfg. Co., 2nd vice president; F. P. Green, Crown Rheostat and Supply Co., 3rd vice president; T. A. Trumbour, Metal Finishing, treasurer; J. J. Duffy Jr., Pennsalt Chemicals Corp., past president; R. M. Norton, Hanson-Van Winkle-Munning Co.; C. C. Helmle, Enthone Div., American Smelting and Refining Co.; L. J. Minbiole, The Udylite Corp.; T. R. Gill, The G. S. Equipment Co.; A. P. Munning, Munning and Munning Co., executive secretary.

London Corrosion Convention

A National Anti-Corrosion Week will be held in Britain from October 14 to 19. Principal features will be a Corrosion Convention, open to everyone interested,

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at Central Hall Westminster, London, on October 15 and 16, and a Corrosion Exhibition, at the Royal Horticultural Society's Old Hall, October 15 to 17. A number of overseas delegates have already been registered for the convention, and it is hoped that many U.S. visitors will attend.

Papers by leading British experts will cover many aspects of corrosion, including among other topics: Paints and Corrosion; Metals and Alloys; Metal and Plastics Spraying and Finishing; and Water Treatment.

Inquiries should be addressed to the Organizer, Corrosion Convention, Stratford House, 9 Eden Street, London N.W.1. This campaign against industry's losses from corrosion is being supported by many British technical associations and engineering societies, and is being organized by the Leonard Hill Technical Group.

Silvio C. Taormina

Silvio C. Taormina, popular champion of the job plater, died June 8 of heart failure at the Long Island College Hospital, Brooklyn, N. Y., following a year's illness. He was 54.

Born in Sciacca, Sicility, April 13, 1903, the long-time executive secretary of the Masters' Electro-Plating Association of New York came to the U.S. in 1906. He was educated in New York schools and received his B.S. in Ch. E. from both Pratt Institute and Brooklyn Polytechnic Institute.

S. C. Taormina

More recently he served on the nickel committee of the National Association of Metal Finishers. He was one of the job plating industry's leaders in the fight for an equitable distribution and allocation of nickel and job plating industry recognition by Washington officials.

In paying tribute to Mr. Taormina, NAMF president John Palik Jr. referred to him as a "steadfast, dynamic, determined leader who, as a scientist, could apply technical knowledge in human terms to relationship with people—a characteristic which too few in the technical field possess today."

Mr. Taormina is survived by his wife, Mrs. Kate Taormina, New York; a married daughter, Mrs. Ira Cohen, and two granddaughters; his father, Antonio Taormina; and a sister, Mrs. Rose Sanfilli.

He was associated in business with Unit Process Assemblies, Inc., Platers' Supply Co., and Platers' Research, Inc., of New York and Chicago.

Eric S. Anderson

Eric S. Anderson, sales manager, Industrial Division of Sparkler Manufacturing Co., died suddenly April 29 in his home in Libertyville, Ill., at the age of 47. He leaves a wife and two children. Anderson joined the filter manufacturer in 1945 and held positions in production, purchasing and sales before being appointed Industrial Division sales manager.

Harry T. Paterson

Harry T. Paterson died suddenly of a heart attack on May 27. Mr. Paterson was principally responsible for the operation of the Sea Horse Institute's testing facilities at Kure Beach and Harbor Island, North Carolina. He had designed and supervised the construction of the testing devices and buildings. To commemorate his memory, members of the Sea Horse Institute have established the Harry T. Paterson Memorial Fund to be used to provide a college education for his two children.

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ARTICLE REFERENCES

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Most of the articles listed here may be obtained by writing to the publications in which the articles were published. Addresses are given at the end of the references for the reader's convenience.

Photostat or microfilm copies of articles in available magazines may be obtained from: Library of Congress, Washington, D. C.; New York Public Library, New York; Engineering Societies' Library, New York, at prevailing rates. In other cases, consult Wilson's Union List of Serials at your nearest public library for other sources of these articles.

285. ELECTROPLATING

a. *SURFACE TREATMENT AND FINISHING OF LIGHT METALS. PART XII-D. PLATING ON ALUMINUM—THE VOGT PROCESS.*
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b. *ELECTRODEPOSITION FROM SULPHAMATE SOLUTIONS. PART III. NICKEL-ZINC ALLOYS.*
S. Sathyanaraya and T. L. Rama Char.
India Section, Electrochemical Society, Bulletin, *5*, October 1956, p. 83–85.

"A bath containing nickel and zinc sulfamates used for the co-deposition of nickel and zinc. At cathode efficiencies close to 100 per cent, the nickel content in the alloy deposit is very low. It is possible to increase the nickel content to high values at the sacrifice of efficiency. 8 ref."

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a. *CORROSION-RESISTANT FLOORS. PART I.*
V. Evans.
Corrosion Technology, *4*, No. 3, March 1957, p. 95–97.

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a. *PLASTICS-BASED STRIPPABLE COATINGS.*
E. S. Lower and S. Cressey.
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b. *COATINGS FOR PROTECTION OF ELECTROPLATING EQUIPMENT.*
Michael Perez.
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a. *HOW RHEEM AUTOMOTIVE COMPANY PLATES BUMPERS.*
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a. *DETECTION OF CHEMICAL PROTECTIVE FILMS ON ALUMINUM AND ALUMINUM ALLOYS.*
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a. *ANALYSIS OF PHOSPHATING SOLUTIONS. COLORIMETRIC DETERMINATION OF NITRATE.*
Lloyd O. Gilbert.
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a. *ANODIC FORMATION OF OXIDE FILMS ON SILICON.*
P. F. Schmidt and W. Michel.
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Lester F. Spencer.
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a. *CORROSION OF TITANIUM.*
D. W. Stough, F. W. Fink and R. S. Peoples.
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Ulrich Zwicker.
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Miles V. Sullivan and John H. Eigler.
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a. *FUME EXHAUSTION IN THE PLATING AND ALLIED INDUSTRIES.*
D. J. Fishlock.
Electroplating and Metal Finishing, *10*, No. 4, April 1957, p. 103–108.

Chemie-Ingenieur Technik
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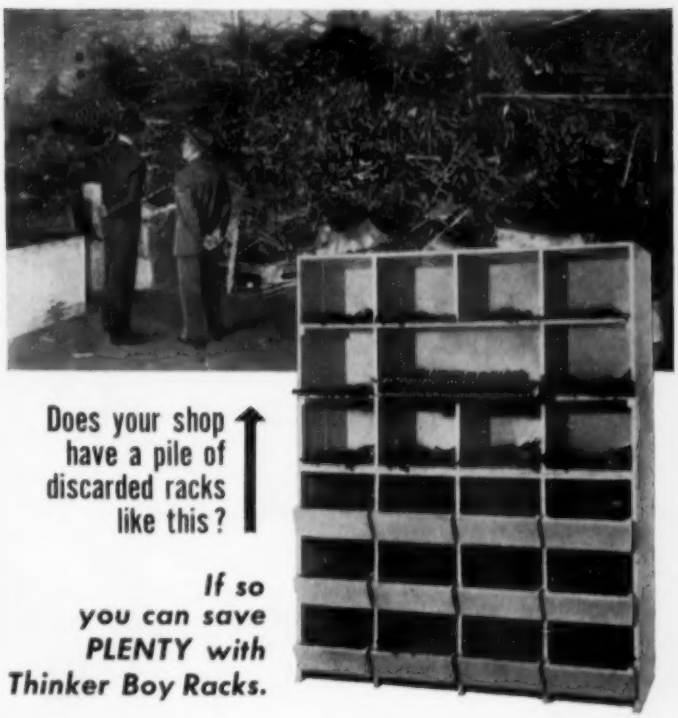

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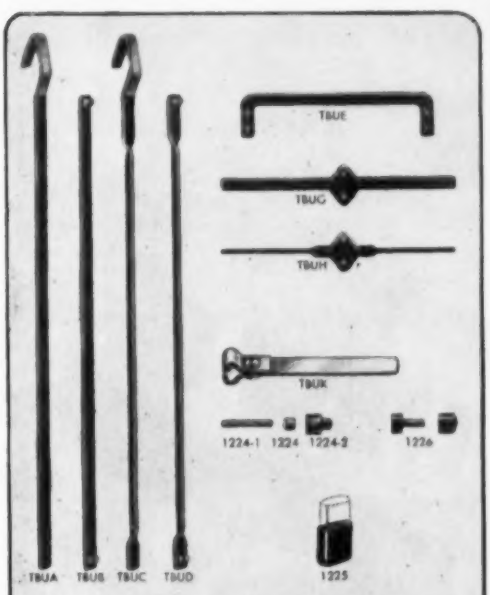

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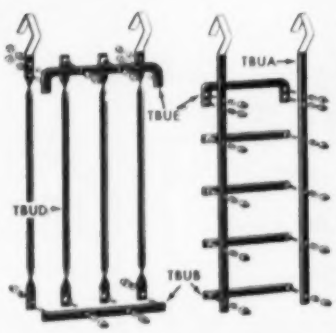

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INDUSTRY NEWS

Universal Rack to Service the South—Announcement has been made of the opening of a new plant by Universal Rack Company, Inc., at 111 West Forest Street, Lebanon, Tennessee. The manufacturing operation has been established to supply engineered racks and fixtures to the plating, organic finishing and material handling industries in the entire Southeastern section of the U.S.

One of the principle types of racks to be manufactured at the new plant will feature new removable and replaceable work holders which will permit easy replacement of tips.

Duke Tyler Scott, general manager of the firm, is an active member of the AES Louisville Branch. The newly appointed sales manager, Harry Tenpenny, is a member of Atlanta Branch, AES.

Duggan Opens New Plant—Duggan Masking Devices have opened their new and larger plant at 7075 Lyndon Avenue, Detroit 38, Michigan. It comprises approximately 20,000 sq ft of office and factory devoted to the production of special and standard "Selective" spray-painting, plating and abrasive blasting equipment.

Patent Granted to Korbelak—A patent covering a new method and apparatus for the manufacture of uniform-thick, ultra-fine wire has been granted to Al Korbelak, sales manager of Sel-Rex Corporation's Precious Metals Division. Utilizing an electrolytic method which, the patent claims, affords uniform diameter and eliminates strand breakage during conventional reduction, the method and apparatus was invented jointly by him and Clair M. Rively, while both were employes of the Westinghouse Electric Corporation, to which concern the patent has been assigned.

Mr. Korbelak also holds several other patents on pulsating techniques for plating and metal processing, and has published a number of technical papers on electroplating "difficult" metals.

Prior to joining Sel-Rex early in 1955, Mr. Korbelak was editor of PLATING. Before that, he spent 11 years in the electronics, chemical and metallurgical departments of Westinghouse, and was electrochemist with Seymour Manufacturing Co.

Marchuk Represents Technic in West—Technic, Inc. of Providence, R. I., has appointed The Marchuk Co., 261 East Colorado Street, Pasadena, Calif., as its representative in the states of Arizona,

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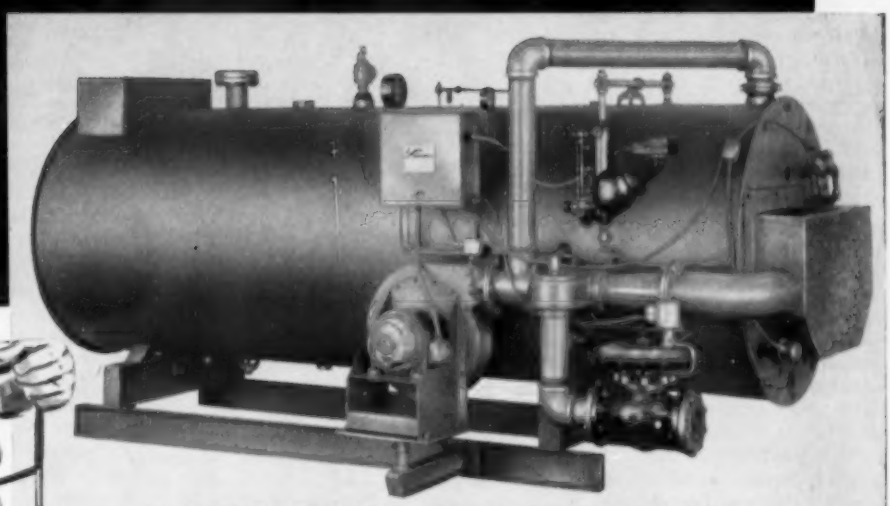

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INDUSTRY NEWS

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As manufacturers of soluble precious metals, Technic, Inc. has developed electroplating equipment for their application. In addition to electroplating systems, Marchuk will distribute Technic potassium gold cyanide, sodium gold cyanide, hard bright gold, rhodium sulfate, paladium plating solution, platinum plating solution, immersion tin, and Protector silver and copper anti-tarnish.

Enthone Bought by American Smelting—American Smelting and Refining Co. has acquired all of the outstanding stock of Enthone, Inc., New Haven, Connecticut, in exchange for shares of common stock of ASARCO. Enthone manufactures metal finishing specialties and equipment and will be operated as a subsidiary of ASARCO.

The acquisition of Enthone is expected to add impetus to ASARCO research efforts in the continued development of new products and processes to meet the requirements of the metal finishing industry. Enthone was founded in 1938 by Dr. Walter R. Meyer and J. F. Buckman.

Sales and distribution policies will be coordinated as quickly as possible. Dr. Meyer will continue as president of Enthone. M. R. Herman of ASARCO will replace Mr. Buckman, vice president, who is retiring. C. C. Helmle, Enthone sales manager, and Sherman M. Goble, manager of Federated's electrochemical department, will coordinate the sales efforts.

Cleanite Completes Expansion—Cleanite Products Inc. of Philadelphia has just completed a major expansion program. A new building containing 9000 sq ft will house manufacturing and laboratory facilities for metal finishing compounds and chemical specialities. Production capacity has been more than doubled by the recent move.

Research efforts are being increased and several new products are currently being introduced on the market.

Sethco Moves to Merrick—Sethco Mfg. Co. is occupying new factory and offices in its recently completed building at 2290 Babylon Turnpike in suburban Merrick, N. Y.

Devoted exclusively to the development and manufacture of filters, pumps and filter pump units, the modern plant is fully equipped with many new, streamlined production methods for greater output, quality control and economy. Increased floor space, manufacturing and warehousing facilities will speed-up service.

Also expanded is Sethco's research department working out solutions to filter problems. According to Jules Englesberg, general manager of the company, more emphasis will be directed toward the needs of customers requiring custom designed filters built to order.

"A Flexible and Resilient Buff for Flat or Irregular Surfaces"

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ZIP-TIP BUFFS

The radial segment construction of the Zip-Tip Buff permits it to perform equally well on flat or contoured surfaces. The cross-cutting movement of the spoke-shaped segments prevent work streaking while it breaks up straight-line patterns on the surface.

- Zip-Tips are available in a wide variety of all cloth constructions—also combinations of cloth and sisal.
- Zip-Tips are made of heavy-duty, bias-cut materials mounted on ventilated steel centers.
- Zip-Tips are extra thick and provide wider buff faces with greater compound retention capacity.
- Zip-Tips are perfectly balanced—require no raking.

Write for Descriptive Literature

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DETROIT 7, MICHIGAN
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For Every Plating and Metal Finishing Plant Requiring Waste Analysis Methods

Procedures for Analyzing Metal Finishing Wastes

Comprehensive manual of 102 pages containing precautions to be observed in collecting samples of metal finishing wastes, fundamentals of sampling techniques, the determination of cyanide, cyanate, cadmium, chromium, copper, iron, lead, manganese, nickel, zinc, ammonia, chloride, chlorine, nitrate-nitrite nitrogen, ortho-phosphate, and sulfate—and a section on pH and residue.

This valuable publication, developed from American Electroplaters' Society Research Project at Lehigh University and expanded and prepared by the Metal Finishing Industry Action Committee of the Ohio River Valley Sanitation Commission is available at

Only $1.00 prepaid with order.

American Electroplaters' Society, Inc.
445 Broad Street
Newark 2, N. J.

INDUSTRY NEWS BRIEFS

● The Business and Defense Services Administration of the U.S. Department of Commerce is stepping up enforcement of priority regulations, particularly with respect to nickel certified for national defense purposes.

Three violators of priority regulations were sentenced on June 26 in New York City for the illegal acquisition of single nickel salts.

Priorities regulations are issued by BDSA to assure timely deliveries of materials for military and atomic energy production and construction.

Maximum penalty for false statements to agencies of the Government is five years imprisonment, a fine of $10,000, or both, for each offense. Maximum penalty for conspiracy to violate the Defense Production Act is a fine of $10,000, imprisonment for one year, or both.

Additional cases are awaiting handling by the United States Attorneys and still others are being prepared for referral to the Criminal Division of the Department of Justice with a recommendation for criminal prosecution.

● ODM has announced that the nickel expansion goal has been closed. The objective has been filled based upon industry plans for 440 million pounds of expanded production.

● An electroplating correspondence course is being established in Spain. The Instituto Electroquimico, S. A. of Barcelona, through contractual agreement with the Joseph B. Kushner Electroplating School, Stroudsburg, Pa., has made a Spanish translation of the Kushner course, ELECTROPLATING KNOW HOW.

The course has been approved by Spain's Ministry of National Education, which considers it a significant contribution toward the development of that country's industrial techniques. Mr. Kushner will not be directly connected with the Spanish course, but will act as advisor. It is understood a University of Barcelona professor, familiar with electrochemistry and plating, will grade papers and instruct. The Kushner school will be furnished with a duplicate file of the names, addresses and grades of all Spanish students.

● New supply of lead made available in April totaled 114,800 short tons, and 93,900 tons were consumed. Imports of lead in the same month were 8 per cent above March.

● Total tin consumption in the United States declined 200 long tons in 1956. Primary tin consumption reached the highest level since 1950. The use of tin by the tinplate industry increased 4 per cent, whereas use in all other industries decreased 2 per cent.

● Shipments of copper sulfate in April rose 14 per cent over March, and were the largest since March 1953, according to the Bureau of Mines, United States Department of the Interior. Production increased 7 per cent in April. Inventories were the lowest since March 1956 amounting to less than 2 weeks' requirements at the April rate of shipments.

● The International Tin Research Council, founded in 1932, celebrated its 25th anniversary July 10 and 11 at the Tin Research Institute, Greenford, England, where the Council's headquarters and laboratories are situated. G. F. A. Burgess is chairman of the Council and its director is Dr. E. S. Hedges who has been with the Council for the whole 25 years of its existence.

● A revised and expanded edition of "Our Plating Industry" is being prepared by The Almond Publishing Company, Inc., 412 Albee Building, Washington 5, D. C. for publication in December 1957. This directory will carry listings both of metal finishers furnishing metal finishing services and suppliers of materials and equipment in the United States and other countries of the Western Hemisphere.

Brass Plating

●

With summer time one difficulty that invariably shows up on brass plate is spotting out. The cause of spotting out is definitely due to the base metal. Probably the most effective treatment is the use of chromic acid or chromate. Exact method of use depends on time and place of treatment. Generally the parts are dipped in weak chromic acid or sodium bichromate from 10 to 30 seconds, the solution being at room temperature and followed by rinsing and drying or in some cases burnishing. Many proprietary materials are available which are of various types but are not more effective than the proper use of chromates.

●

The use of a nickel undercoat with the brass plate is of considerable help in spotting out. Other undercoats from cyanide solutions are not effective.

●

A related trouble with brass plate is staining. This is caused by contaminated rinse water, corrosive atmosphere and poor handling or drying. If the brass looks good directly out of the solution and stains during the rinsing and drying it may be due to one of these factors. The brass solution may be out of balance and accentuate the staining. A brass solution that is high in cyanide will stain or tarnish very rapidly in spite of good handling.

●

Over the years many articles have been written and much information passed around verbally about brass plating. Much of this information is misleading. True Brite Chemical Products Company has been working on brass plating for over ten years and the solution formulations we recommend are proven trustworthy for production use. We have the materials to make the job easier, anodes of highest quality suited for brass plating and analytical methods you can depend on.

●

We do not have a brass solution that will plate bright on dull surfaces and have never seen any such outside of experimental work. Our bulletins tell you what we can do and are your best guide to good brass plating.

TRUE BRITE CHEMICAL PRODUCTS CO.
98 FALLS AVENUE OAKVILLE, CONN.

PATENT ABSTRACTS

DR. D. GARDNER FOULKE
Manager, Electrochemical Development
Hanson-Van Winkle-Munning Co
Matawan, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.

No. 2,777,810, January 15, 1957—Bath for Electroplating Silver—B. Ostrow, assignor to Elechem Corp., Jersey City, N. J.

The use of selenium in the valence of −2 as a silver brightener is claimed. Example 4 gives a typical bath composition as:

AgCN	45 g/l
NaCN	20 g/l
KCN	50 g/l
KCNSe	0.0018 g/l
Rochelle Salt	22.0 g/l
KSb tartrate	1.0 g/l
Na lauroyl sarcosinate	0.75 g/l

No. 2,778,742, January 22, 1957—Impregnating Ferrous Parts with Copper—P. Shipe, assignor to General Motors Corp., Detroit, Mich.

Ferrous parts, after impregnation with a mixture of 1–5 per cent of cast iron powder mixed with cupreous metal, are substantially free from pits, channels, and the like.

6 claims.

No. 2,778,756, January 22, 1957—Process for Hardening Steel—N. Bredzs, Chicago, Ills.

Claim 1 describes the invention as: "The method of treating a mass of hardenable steel consisting in heating the mass to a temperature at least slightly above its transformation temperature to form a homogeneous austenitic structure, maintaining said article at such temperature throughout while simultaneously applying a pressure amounting to at least 15 tons per square centimeter over the surface of said mass to minimize the formation of a pearlite structure upon cooling, and permitting said article to cool at a moderate rate under the influence of said pressure whereby the steel will be transformed directly from an austenitic structure to substantially a martensitic structure."

No. 2,778,786, January 22, 1957—Coating a Carbonaceous Surface with Rhenium—H. Perlman, et. al., assignors to United States of America (AEC).

To bond rhenium securely to a carbon, part plate the part with rhenium, then heat in a vacuum at a temperature of at least 1100 C. The rhenium then forms a protective coating over the carbonaceous body and has good bonding properties as high as 1000 C.

10 claims.

No. 2,778,787, January 22, 1957—Electrodeposition of Iron-Zinc Alloys—F. Salt, assignor to British Iron and Steel Research Association, London, England.

The bath is described as containing a source of iron and zinc ions, an ammonium salt, citric acid and an alkali metal chloride. Example II describes a bath producing a deposit of about 44 per cent zinc:

Ferrous chloride	177 g/l
Zinc chloride	48 g/l
Ammonium chloride	30 g/l
Potassium chloride	15 g/l
Citric acid	0.5 g/l

The bath is operated at pH of 1.25, a temperature of 50 C and 750 asf.

17 claims.

No. 2,778,788, January 22, 1957—Copper Plating Brightener—Daniel R. France, Brooklyn, N. Y.

The brightener is made up as follows: 4 oz of molybdic acid, 1 oz of lead tartrate, 5 gs of ammonium acetate, 100 cc of ammonium hydroxide, 200 cc wetting agent, 4 gs of sodium stannate, 4 gs of cadmium oxide, ½ oz of sodium cyanide, 8 oz of sodium hydroxide made up to 1 gallon with water. In the disclosure it is stated that up to 6 oz of brightener is added to each gallon of plating solution.

6 claims.

No. 2,778,789, January 22, 1957—Electrolytic Protective Coating for Magnesium—W. McNeill, assignor to United States of America (Army).

A protective coating is formed on magnesium and alloys thereof by impressing an alternating current voltage of up to 300 volts on articles immersed in a solution containing a chromate, a phosphate and a fluoride that yield non-metallic cations only. The pH is given as 5.5 to 9.0. The bath is given in the disclosure as being from 0.25 to 2.25 M with respect to phosphoric acid, 0.30 to 4.00 M with respect to hydrofluoric acid and from 0.05 to 0.7 molar with respect to chromic acid. Sufficient ammonium hydroxide is added adjust the pH to 5.5 to 9.0. The preferred current density is 12 to 15 asf, based upon the area of both electrodes.

7 claims.

No. 2,778,790, January 22, 1957—Decorating Anodized Aluminum—C. Sobol, assignor to Croname, Inc., Chicago, Ill.

This process for decorating aluminum consists of printing on the unsealed, anodized, surface with a water insoluble but water permeable vehicle and water insoluble dye, then, before removing excess vehicle from the printed surface, hot water sealing through the water permeable, insoluble vehicle left on the sealed surface of the aluminum. After sealing the vehicle is removed. One vehicle is described as ethyl cellulose. Oil-soluble dyes such as Cibas' Orasol and Oracet are used.

4 claims, 5 figures.

No. 2,778,791, January 22, 1957—Electrolytic Method for Cleaning Containers—I. Duncan, assignor to Detrex Corporation, Detroit, Mich.

The method is primarily directed towards the cleaning of soiled tin-plated bread pans having aluminized steel reinforcing bands for which normal cleaning materials are unsuitable. To inhibit alkaline electrolyte attack on the tin or tin oxide, the articles are made anodic in the hot cleaner, direct current passed at a potential of about 1 to 8 volts. Example 2 describes the bath as containing 5 oz/gal of:

Sodium meta silicate	15 per cent
Soda ash	85 per cent

operated at 4 volts and 1 asf.

4 claims.

No. 2,778,794, January 22, 1957—Electrolytic Grinding Apparatus—G. Comstock, III, assignor to Norton Co., Worcester, Mass.

By means of 18 claims and figures, an electrolytic grinding apparatus, controlled by alternating current, but containing rectifying means so that the work-piece is positive, is described.

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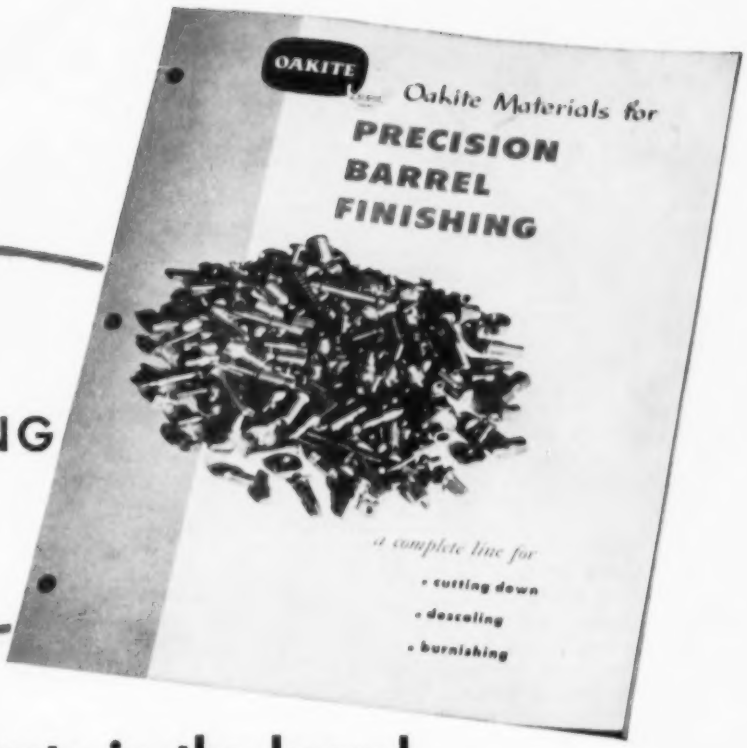
GAME



PUT your products in the barrel
TAKE your profits out

A great way to save money is to barrel finish metal parts by the hundred instead of manually finishing one part at a time.

Next time a job of grinding, deburring or buffing proves too costly on a wheel, try it in a barrel. The results are often so surprising that barrel finishing becomes an exciting and profitable game.

One Oakite customer changed to barrel methods to deburr curved stainless steel strips that are 14 inches long. The cost for deburring 20,000 strips was reduced from $3,000 to $125.

FREE For a copy of *"Precision Barrel Finishing"* write to Oakite Products, Inc., 40 Rector St., New York 6, N. Y.

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L—800. Metallizing and Welding Bulletins—The Protective Coatings Division of Metalweld, Inc., has just published two new bulletins describing its services to industry.

The first deals with the subject of metallizing which is the process of spraying molten metals onto a base surface to build up worn mechanical equipment, to apply hard wearing surfaces, to correct surface defects and to restore dimensions. By this method, according to Metalweld, old parts can be salvaged, mis-machined parts and castings reclaimed, outside diameters increased, inside diameters increased, mechanical, chemical or electrical properties imparted.

The second bulletin covers welding repairs of structural and processing equipment as well as fabrication of the latter. The bulletin outlines the various welding processes used for making repairs to broken or worn machinery, structural repairs to railroad bridges, storage tanks, material handling equipment.

L—801. Carbide Tool Guide—A new carbide tool catalog and metalworking guide is announced by the Abrasives division of Elgin National Watch Co.

Containing information on the company's complete line of carbide rotary tools under the "Golden Circle" name, the booklet is available to the trade.

Highlighted is information about Elgin's new line of "electroground" end mills, which are manufactured by a revolutionary electrolytic process.

Two pages of the publication are devoted to operating suggestions covering end mill, reamer drill and bur speeds, as well as data on recommended feeds when working with most metals, hard rubber and plastics.

L—802. Demineralizer Operating Costs—Graver Water Conditioning Co. has available copies of Technical Reprint T-153. This new paper discusses the role that demineralizer subfill plays in reducing costs of the operation of a demineralizing system.

Since the anion exchanger portion in a demineralizing plant must be rinsed with already treated water before returning to service, any reduction in rinse requirements results in actual operating cost savings. In addition, a reduction in rinse requirements reduces such problems as outage time, overly sized cation units and waste disposal.

This paper, which has many actual curves on results, goes into the details of rinse requirements and the factors effecting these requirements. Actual laboratory investigation plus field results are discussed in detail and the experimental data is presented. Methods of reducing the rinse requirements and thus reducing costs are outlined.

L—803. Copper and Brass Cleaning Process—Becco's new procedure for removing oxide films and stains is said to leave a very clean metal surface that will not tarnish over a period of about two weeks' exposure to normal environment, has a slight etch, and possesses excellent bonding properties which make the process suited as a prepare for electroplating, dip-soldering, photo-resist adhesion and lamination.

Details of the process, a 25 per cent solution of ammonium persulfate at room temperature for cleaning brass and copper is described in Becco Bulletin, No. 86, being distributed by Becco Chemical Division, Food Machinery and Chemical Co.

L—804. Surface Treatment of Metals—An 84-page booklet describing the latest developments in the surface treatment of metals is made available by E. F. Houghton & Co.

The recently published handbook covers rust prevention, mechanical and chemical cleaning, blackening, phosphating and other aspects of the field of metal surface treatment.

L—805. *p*H Electrodes—Eight-page bulletin 36-5 features Beckman *p*H electrodes for laboratory and portable *p*H meters. The electrode bulletin is made up in simplified chart-form, completely indexed and illustrated—designed to guide users in selecting correct *p*H electrodes.

L—806. Coagulant Aids for Water Clarification and Waste Treatment—A new four-page bulletin describing Hagan coagulant aids for use in industrial water clarification, and waste water treatment systems has been released by Hagan Chemicals & Controls, Inc.

The booklet points out that these aids speed up floc formation and also tend to produce larger, heavier, tougher flocs over wider *p*H ranges than coagulants alone.

Schematic drawings in the booklet illustrate the two principal methods of preparing aid slurries—continuous dry feeding (for large systems) and batchwise feeding with a tank and mixer (small systems).

L—807. Filtration Equipment—Bulletin EP-100 "Modern Filtration for the Plating Industry" is a new 16-page manual just published by Industrial Filter and Pump Mfg. Co. It features Industrial's complete facilities.

Tubular, vertical and horizontal filters are covered in detail, showing typical installations, flow diagrams and cross section drawings.

The manual includes full data on Industrial's new bottom outlet, bottom drop type 152 filter. Leaf application data and construction features of the bottom and top outlet leaves are covered.

The bulletin also features diagrams and latest information on Industrial's recovery or destruction system.

L—808. Paint Spray Booths—A new bulletin just issued by Ramco Equipment Corp., a division of Randall Manufacturing Co. claims maintenance costs are reduced and fire hazards eliminated by the features of their multi wash paint spray booths.

Designed to overcome maintenance problems commonly experienced in water wash paint spray booths, four separate stages of washing the air stream eliminate fire hazard due to build-up of accumulated flammable paint solids in the washing chamber and exhaust stack and insures health of operators. The bulletin describes the several baffles which control the water flow, maintain maximum velocity through spray booth, and wash even the extremely small paint particles with unpolluted water from the exhausted air stream.

L—809. Corrosion Proofing—Selecting the best corrosion proofing methods and products, determining comparative resistance of various cement mortars and calculating quantities needed are outlined in a revised, up-to-date edition of Pennsalt Chemicals Corp.'s corrosion proofing brochure.

The 8-page illustrated manual contains tables giving detailed information on Pennsalt's line of corrosion proofing cement mortars, interliners, protective coatings and linings.

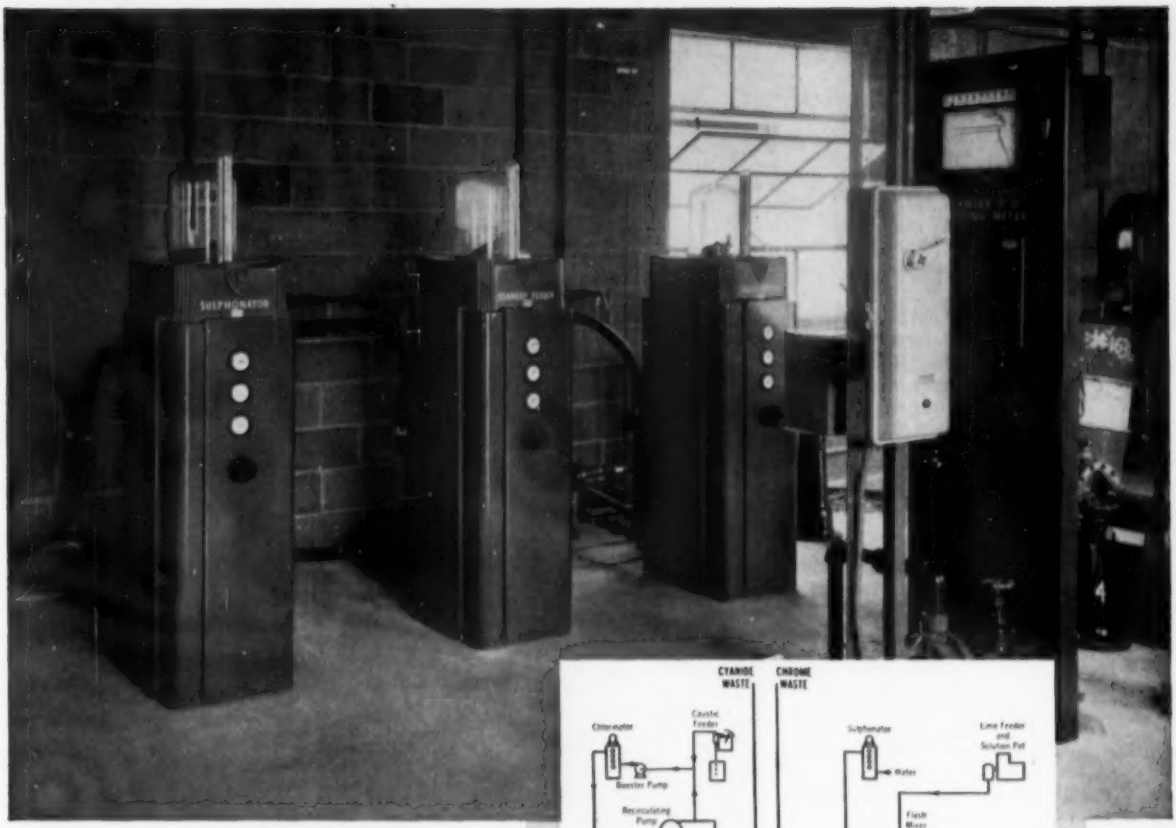
Installations surveyed include linings in acid concentrators, stacks, pickling tanks, brick and tile floors, as well as sumps, pits and trenches for handling industrial wastes.

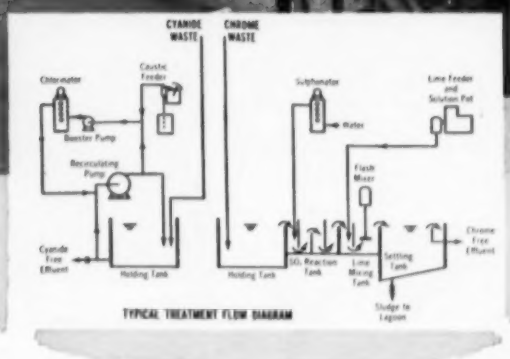
L—810. Copper Specifications—Publication of a new, enlarged edition of "Copper & Copper-Alloy Specifications Index" has been published by The American Brass Co. The 28-page booklet is divided into three parts:

Section I is a list of the most generally used alloys and products of the company, together with the applicable specifications of the eight following agencies: ASTM, ASME, AWS, SAE, AMS, Federal, Military, and Joint Army-Navy.

Section II lists specifications in numeric order with a brief description of the material.

The new edition contains an added Section III, which tabulates chemical compositions of all Anaconda metals covered by standard specifications. Copies are available free of charge.





DAYSTROM INSTRUMENT DIVISION USES

W&T *Cyanide & Chrome Waste Treatment*

The Daystrom Instrument Division of Daystrom, Incorporated, located at Archbald, Pennsylvania, has provided a compact and efficient treating plant to destroy the toxic components of their plating waste. The treatment plant has been in continuous operation since 1953.

The cyanide bearing waste is treated with chlorine and caustic, using a W&T Water Diaphragm Chlorinator and a W&T Chemical Solution Feeder. The treatment breaks down the cyanide to harmless carbon dioxide and nitrogen gas components.

The chromium bearing waste is treated with sulphur dioxide and lime, using a W&T Sulphonator and a W&T Dry Chemical Feeder. The treatment removes the toxic chromium and other heavy metals from solution, to be disposed of as sludge.

If you would like more information on Wallace & Tiernan cyanide or chromium waste treatment, write for bulletin RA-2120-CP.

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

I-53

BIBLIOGRAPHY ON METAL FINISHING WASTES, 1956

by C. F. Gurnham and D. G. Foulke

This listing continues the 1955 bibliography which was published in the June 1957 issue of Plating. Additions to the list will be appreciated.

No attempt has been made to include general articles on industrial wastes unless metal finishing wastes are discussed in detail. Organic finishing wastes are not included. Analytical methods for metal ions are not included unless the articles relate specifically to effluents from metal finishing operations (the analysis of cyanide is, however, included).

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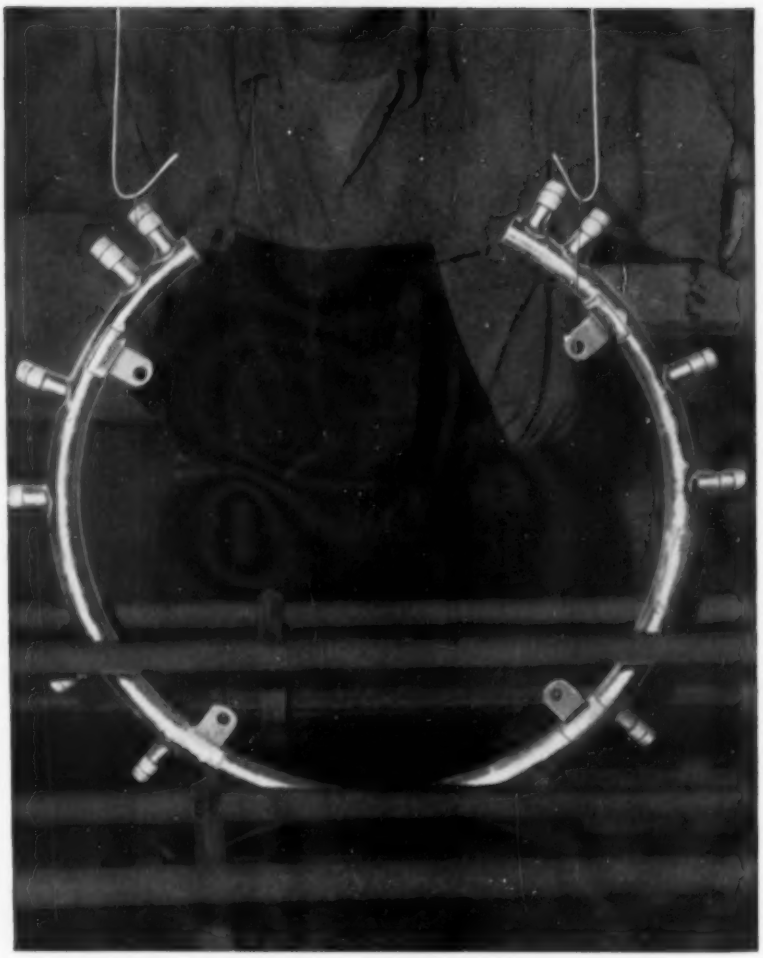

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Copper anodes in all shapes and forms; lead anodes, including the famous Conducta-Core, which have greater throwing power, yet last three or four times as long as other lead anodes; zinc, tin, tin-lead, cadmium and brass anodes.

NICKEL SALTS:
Produced by ASARCO under constant quality control that assures full nickel content and identical plating characteristics from every lot.

PLATING ADDITION AGENTS:
Cadmax for still or barrel cyanide cadmium plating; Zimax in liquid or powder form; Nimax for low-cost bright nickel plating.

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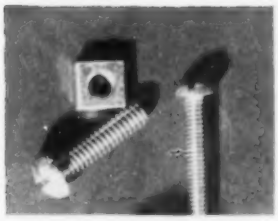

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All Federated Plating Brighteners are **competitively** tested in the field to prove that they will do a better job at a lower cost. Among Federated's superior plating materials are these three that have been thoroughly tested against competitive brighteners:

1. CADMAX for cyanide cadmium plating . . . compatible with all organic brighteners . . . comes with an adjuster solution to give brilliant results, even from a new bath. And no break-in is required.
2. ZIMAX is applicable to every type of zinc operation and compatible with most other zinc brighteners. It is the most economical to use, comes in powder or liquid form.
3. NIMAX for use in barrel nickel plating. It is highly concentrated, five cents' worth being enough for about 50 pounds of work. The deposit is ductile and extremely corrosion-resistant.

Federated plating products are tested and proved for specific advantages or a better combination of properties before they are approved for sale. Next time your Federated distributor or field representative visits you, let him **show** you how Federated products will actually work better, and at lower cost.

Federated Metals ASARCO

Division of

AMERICAN SMELTING AND REFINING COMPANY

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In Canada: Federated Metals Canada, Ltd., Toronto and Montreal

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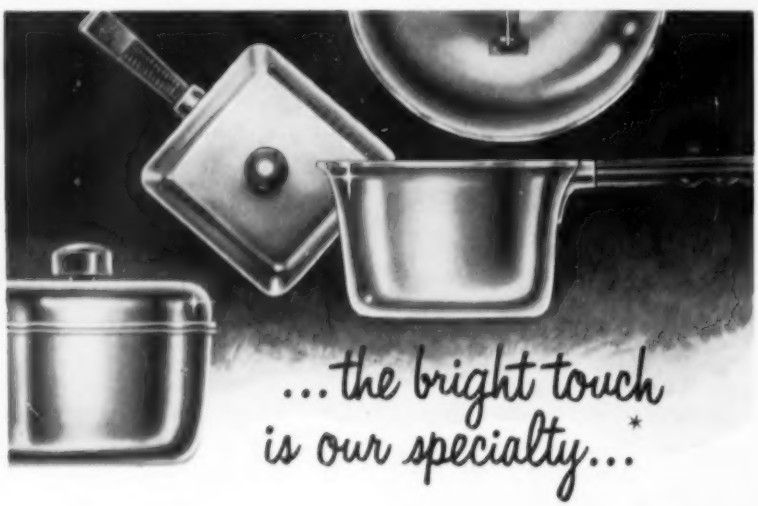

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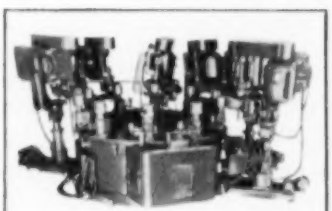

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with **HTH** *– the "dry" chlorine*

Chlorine's ability to convert poisonous cyanide to relatively harmless cyanate . . . plus the convenience of a *dry*, 70% available chlorine product . . . explains the ever-widening use of HTH to treat cyanide waste in the metal processing industry.

No costly equipment is needed. No special skills. HTH is safe and convenient to handle—and can be added right to cyanide waste solutions.

Safety . . . plus savings, too. HTH is stable—stores indefinitely, yet goes to work the minute you use it. There's no mixing, no carboys, no breakage, no waste. And in this dry, concentrated form, chlorine is as safe and easy to use as it is effective.

Find out why HTH is unmatched as a source of chlorine. For more information on the use of HTH for effective, economical treatment of cyanide waste, write today.

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For a slow, steady source of chlorine over a longer period, there's HTH Tablets. Packed in 100-lb. drums and in cases of twelve 3¼-lb. cans.

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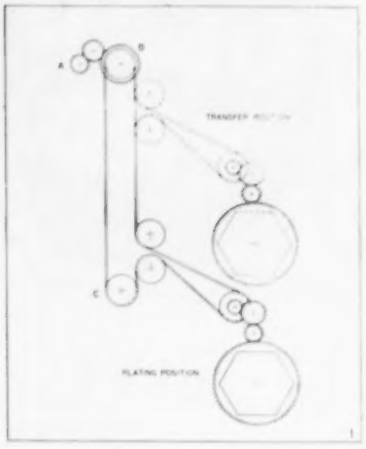
Equipment and Supplies

Use the convenient Reader Service Card to obtain additional information on any of these items

E—811. Alkaline Derusting Compound—Wyandotte Chemicals Corp. announce, after a full year of field testing, Ferlon, an alkaline derusting compound. Made for tank use, either with or without current, Ferlon removes rust, oxide, light scale, oil, grease, paint and smut. Shortened plating cycles have been reported through the elimination of an acid dip and rinse prior to plating. Stainless steel aircraft parts and automotive flywheels have been cleaned of smut, carbon and rust without etching the base metal.

E—812. Automatic Barrel Plating Machine—A new automatic barrel plating machine that offers variable cylinder rotation speeds and a unique method of centralized cycle control, has been announced by Hanson-Van Winkle-Munning Co.

The new machine features an answer to the vital problem of "pile-up" and storage in the plating room. With a return-type conveyor, the H-VW-M machine permits a continuous flow of small parts and hardware from the production department or loading dock, through the machine and back again, without pile-up or manual handling.



One-man operation with automated centralized control reduces labor costs and insures uniformity of deposit. The Mercil-type barrels are driven by a constant-tension v-belt and pulley arrangement that permits changing speed of cylinder rotation for best results in each solution tank. By providing gang drives at each section of the machine, the cylinders change rotation to match the tank requirements without the necessity of mounting costly, multi-speed motors on each cylinder frame.

Cylinders are available in Plexiglas, Melamine and Tempron in all standard models and sizes. A coverless, self-unloading cylinder of Plexiglas may be specified. New cogged-belt driven cylinders are also offered for installation with the machine. Instead of a gear drive on the cylinder frame, each end of the barrel is driven by a cogged belt which offers non-slip design simplicity and reduces maintenance problems.

E—813. Repair Kit—A complete new low cost repair kit for plexiglass and lucite plating barrels has been put on the market by Frederic B. Stevens, Inc.

Repairs, using the new kit, are extremely easy to make since the previous practice of applying layer after layer of fiberglass cloth has been eliminated. The new kit actually permits performance of a simulated welding process permitting an integral bond between repaired area and the original barrel sections.

E—814. Alkaline Paint Remover—A new fast acting, tank type accelerated alkaline paint remover, Benchmark F-195,

ILLINOIS WATER TREATMENT CO.
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CANADIAN DIST.: Pumps & Softeners, Ltd., London, Ont.
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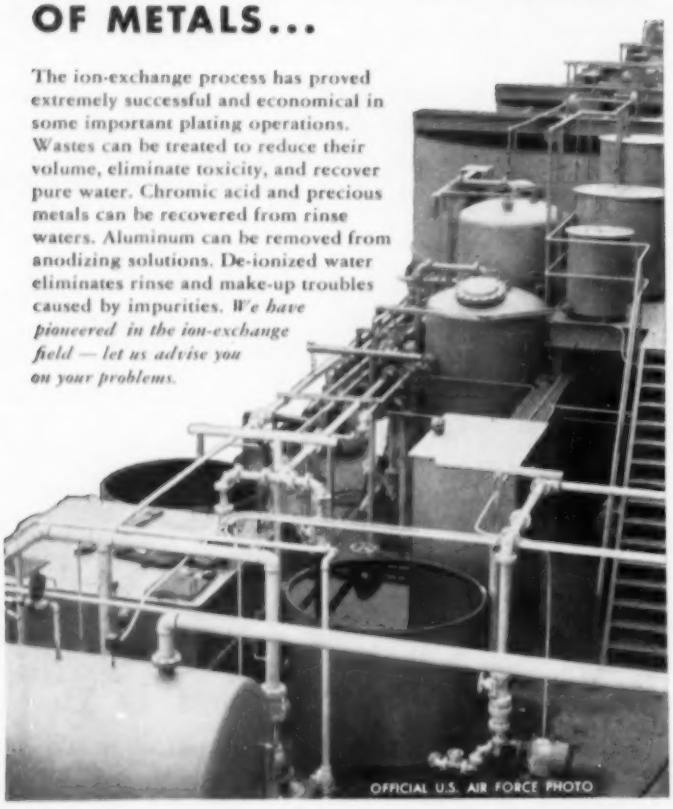
ILLCO-WAY ionXchange

FOR WASTE TREATMENT AND RECOVERY OF METALS...

The ion-exchange process has proved extremely successful and economical in some important plating operations. Wastes can be treated to reduce their volume, eliminate toxicity, and recover pure water. Chromic acid and precious metals can be recovered from rinse waters. Aluminum can be removed from anodizing solutions. De-ionized water eliminates rinse and make-up troubles caused by impurities. *We have pioneered in the ion-exchange field — let us advise you on your problems.*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MIGHTY COOL WAY TO CUT OR COLOR METALS...

WITH AHCO LIQUID BUFFING COMPOUNDS

Ahco Liquid Buffing Compounds are made with the same high-grade abrasives as Ahco bar compounds, but with an emulsion-type liquid binder. These versatile compounds may be applied in several ways: the work or the buff may be sprayed, or the work may be dipped or brushed before buffing. The amount of compound applied to a wheel or buff can be more easily controlled; buffs run cooler — thus eliminating a fire hazard and lengthening buff life. Work surfaces clean more easily; there are no nubbins left over, so you save compound. AHCO Liquid Compounds are especially suitable for automatic buffing

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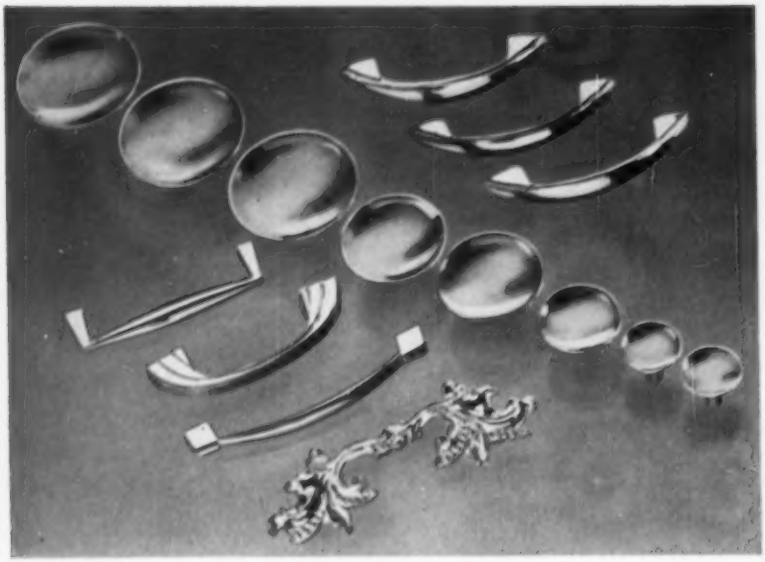


No SPECIAL HANDLING REQUESTED

This means new business for somebody. It could be you.

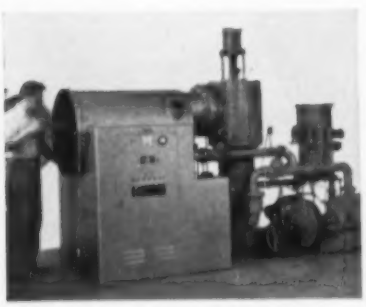
Because vacuum-metallized pieces now can "take it," thousands of products will, for the first time, be finished this new way.

More durable lacquers now protect the superb finishes only vacuum metallizing can produce at low cost. New lacquers and resins now stand up to rigorous abrasion tests and exposure to salt spray and high humidity.

Vacuum metallizing is sure to grow rapidly. New business is waiting for you.

At CEC, we are ready to help you with a full range of vacuum coaters, headed by a large 48" model for metallizing large pieces fast and at low cost.

We'll be glad to send you bulletins on our line of coaters, and share our experience in helping you set up operations.



30" coater—model LC1-30

Typical production: 400 1½" diameter pieces per cycle; 5 to 7 cycles per hour.

48" coater—model LC1-48C

Typical production: 1450 2½" diameter pieces per cycle; 3 to 6 cycles per hour.

Consolidated Electrodynamics

Rochester Division, Rochester 3, N. Y.

formerly Consolidated Vacuum

NATIONWIDE COMPANY-OWNED SALES AND SERVICE OFFICES

has been developed recently by Wagner Bros. Inc.

Claimed to be 2 to 3 times faster acting than ordinary caustic soda-type removers, it can be used to strip ferrous metals of practically all paints, including lacquers and enamels.

Although the new paint remover provides effective stripping in tank temperatures of 180 degrees to boiling, boiling temperatures provide faster results in a given concentration. A concentration of 8 to 16 ounces of the alkaline remover per gallon of water, accompanied by agitation of the solution or work, provides effective results, the company states.

E—815. Powdered Chromate Coating—Conversion Chemical Corp., announces the development of a new powdered chromate coating for producing iridescent films on zinc, cadmium, copper, brass and zinc die castings.

The product may be adjusted to give varying iridescent bronze shades through varying the *p*H, concentration, and the time of immersion. Corrosion protection is ample to meet all Government specifications; and the bath can be operated through controlled temperature to produce films which are hard when wet, and which will not bruise in bulk handling.

E—816. Powdered Rust Remover—Oakite Drycid, a new powdered acid material for removing rust, scale and corrosion with greater safety to metal surfaces as well as personnel, has been introduced by Oakite Products, Inc.

Added to water in concentrations upwards of 8 oz/gal, it is said to go into solution fast and to be useful in applications by circulation or immersion. Solutions of the compound may be used cold or for faster action, heated to 165 F. It is said to be effective in the removal of scale, scale-like deposits, rust, iron sulfide, etc.

Advantages claimed for this new material include its ease in shipment and in storage, as it requires no returnable carboys but is shipped in fiber drums. Also among its advantages are its mild, aromatic odor and non-fuming characteristic; its greater safety on aluminum, brass and galvanized surfaces.

E—817. Chrome Immersion Stripper—Immersion stripping of chrome plated parts is now possible with M-629, a dry acid replacement salt developed by MacDermid Incorporated. Developed originally to replace liquid acids in neutralizing and activitating acid dips in plating operations, M-629 is finding favor as an efficient, easy-to-handle chrome stripper.

In conventional operations in the plating cycle, M-629 users report better activation and plate adhesion, brighter plate and freedom from smut and mottled effects.

UNICHROME

News about

COATINGS for METALS

Metallic.....Organic.....Decorative.....Protective

Simple bronze plating process gives gold-like finish

- ***M&T copper-tin process deposits extraordinary, golden-glow decorative plate . . .***
- ***Also cuts need for nickel as undercoat***

BRONZE plating has proved itself a practical finish in large and small installations. The copper-tin process developed by Metal & Thermit eliminates usual difficulties and disadvantages in alloy plating. It is as easy to operate and control as normal processes depositing a single metal.

Equally important, this bronze can be deposited with brilliant 24K gold color by using a trouble-free brightener. Protected with a clear organic coating, it provides a high quality decorative finish with unusual appeal and long life. Overall cost of this bronze rivals that of copper and is less than that of a brass plate.

M&T Bronze gets the trophies. Golden-glow finish for die cast trophy cups wins over copper-nickel-gold formerly used by leading producer.

VALUABLE UNDERCOAT

As an undercoat, M&T Bronze has these qualifications: Good corrosion resistance; hardness better than copper and virtually equal to nickel; more ductility than nickel.

Undercoat-bronze can be plated semi-bright or matte. Both buff more readily than copper and with less chance of cut-through on edges.

OPERATIONAL ADVANTAGES

M&T Bronze offers better than twice the speed of fast copper plating solutions. There are numerous installations working at normal current densities of 60-75 amps per sq. ft. Densities of 100 amperes deposit over one-tenth mil a minute smoothly.

Golden-glow bronze delivers uniform color on intricate decorative work. So outstanding is its throwing power, it is being used to replace copper on complex automobile parts. It uses single anode circuits, and copper anodes which corrode uniformly. The tin is supplied by potassium stannate additions, assuring simple, economical control of the process.

For an unusual finish, both in appearance and protective function, the golden-glow M&T Bronze Process offers interesting possibilities to metal finishers and designers. Send for data.

What's news in tin anodes

Two types of M&T Anodes are available for tin plating processes.

M&T "High Speed" Tin Anodes, developed for stannate baths, have wider effective current density range than ordinary anodes. Taking higher currents without becoming passive, they speed up plating. They form *darker*, more recognizable working film. They pass more current for a given voltage.

The other type, M&T Pure Tin Anodes, are designed for work both in acid baths and alkaline baths. They're cast from highest purity tin. Send for data on both types.

New economy in chromate finishing

Several newly developed Unichrome Dip Compounds work at extreme dilutions. They offer chromate solutions with still lower make-up and operating costs than previously delivered by economical Unichrome Dips. These new Dips make it practical to preserve shelf life and appearance of galvanized, zinc plated or die cast items, even those having low unit price or narrow margin of profit.

Unichrome is a trademark of Metal & Thermit Corp.

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In Canada: Metal & Thermit–United Chromium of Canada, Limited, Rexdale, Ont.

E—818. Rack and Maintenance Coating—Platers and manufacturers are invited to sample, without cost, the advantages of new, improved XL-8 air-dry rack and maintenance coating introduced recently by The G. S. Plastics Co. A free trial "Squeezon" applicator of XL-8 is included with the purchase of the first gallon. The applicator is designed for quick, easy patching or touch-up, and will enable the user to test-prove the coating within a 30-day period without charge or obligation. The unopened gallon of XL-8 is returnable during the same period for full refund or credit.

XL-8 is applied by dip, spray, or brush over any air-dry or baked on coatings, or uncoated surfaces. No ovens or special equipment required. Replaces common "putty-patching," and dries rapidly to a tough, elastic cover, resistant to abrasion, cuts, and wear.

E—819. Ultrasonic Cleaning Machines—The Circo Equipment Co. now offers a line of seven standard ultrasonic cleaning machines.

Removal of buffing and polishing compounds, honing and abrasive materials, machining chips and non-soluble deposits is practical and rapid with Circosonic ultrasonic cleaning equipment. Blind holes and inaccessible recesses no longer must be hand scavenged and wiped clean. Now in one complete cleaning system, work can be spotlessly cleaned with great saving in labor cost.

Ultrasonic energy is transferred to the cleaning chamber through stainless steel encased Barium Titinate transducers. At an operating frequency of 40 kilocycles, maximum cleaning or cavitation results with a minimum energy input. Transducers are frame mounted and are matched to the output of the ultrasonic generator.

E—820. Paralleling Reactors for Rectifiers—International Rectifier Corp. announces type PR580 paralleling reactors, designed to insure equal distribution of current loads to germanium rectifier junctions operating in parallel. Their development makes possible very heavy current installations of germanium rectifiers formerly limited by the difficulty of matching junctions.

No derating of junctions is required when these paralleling reactors are incorporated in a circuit, since they force each junction to share an equal current load. Heat failure of junctions and life-shortening overload due to unbalanced forward conduction is claimed to be greatly reduced.

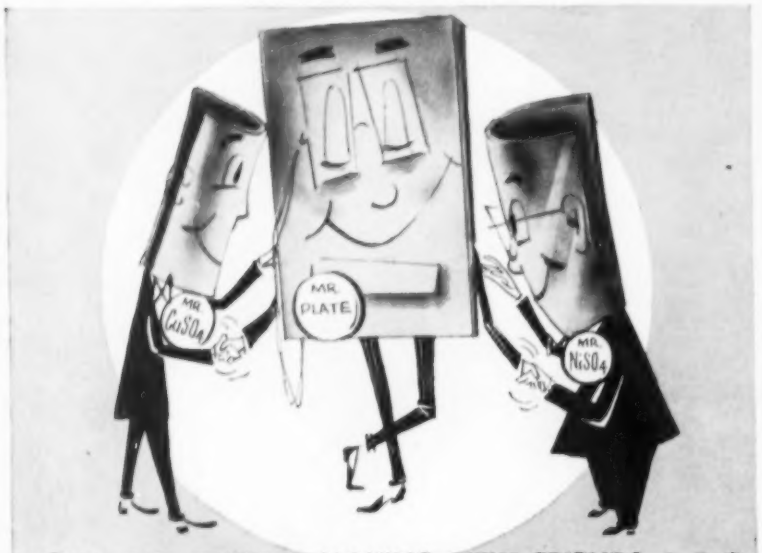
L—821. Protective Paper—A much improved protective paper to guard highly finished surfaces against marring in fabrication, shipment or storage has been announced by Behr-Manning Co., manufacturer of pressure-sensitive tapes and a division of Norton Co.

The new product, designated as No. 190 protective paper will adhere securely, yet can be removed easily after long periods in storage without stain or adhesive deposit. It has sufficient flexibility to permit its use on shaped parts. The paper is 6.5 mils thick, and is normally wound in 100-yd rolls. Widths of 12, 24, 30, 36, 36½, 48 and 48½ in. are available without set-up charge for slitting.

E—822. Gold-Clad Metal Strip—Gold-clad metals—layers of gold metallurgically bonded to inexpensive but high-strength base metals—are now available in ultra-thin and/or extremely close tolerance strip from the plant of the American Silver Co.

This precision-rolled gold-clad metal strip is offered in thicknesses down to 0.0005 in. in tolerances as close as ± 0.0001 in. in ratios of gold-to-base-metal varying with the customer's specifications. The gold layer can be specified as thin as 0.000060 in.

Metals are obtainable with gold clad on one side or both sides. Base metals include: copper, brass, phosphor bronze, pure nickel, and monel.



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TRIANGLE BRAND COPPER SULFATE and TRIANGLE BRAND NICKEL SULFATE as principal sources of copper and nickel in the plating field, are making NEW FRIENDS every day.

The reasons are obvious—purity, solubility, uniformity and high conductivity of their solutions result in QUALITY PLATING.

All-important "extras" found in the use of Triangle Brand Copper and Nickel Sulfates yield long-life plating performance that MAKES THE DIFFERENCE.

Specify: Triangle Brand Copper Sulfate and Triangle Brand Nickel Sulfate for dependable plating baths.

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. . . determines sulfate content in a chromium plating bath . . . directions are easy to follow . . . no calculations necessary . . . readings are directly in ounces per gallon.

● KOCOUR are specialists and pioneers in testing equipment for controlling plating — cleaning — pickling — anodizing — and hardening processes . . . special sets can be provided for your requirements.

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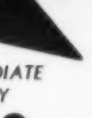

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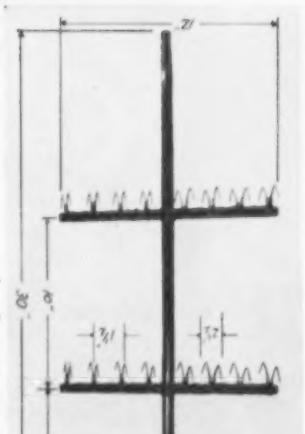

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ZINC PLATERS:

FOR QUALITY PERFORMANCE AT LOWEST COST, purify cyanide zinc plating solutions with

McKeon's Zinc-Brite

BRAND NAME REG. U.S. PAT. OFF.

Regular use keeps zinc solutions constantly clear. Eliminates need for ANY OTHER purifying treatment. Brightens work.

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PERSONALS

Bunch

Noblett

Jess E. (Jack) Bunch and **Richard A. Noblett** have been named manager and assistant manager respectively of the Plating Equipment Division of ARco (Automotive Rubber Co., Inc.) Detroit.

Mr. Bunch comes to ARco after 26 years as superintendent of the Plating Division, Cadillac Motor Car Co.

As manager, Mr. Bunch will be in charge of the fabrication, manufacture, engineering and development of anodizing and plating equipment.

Richard A. Noblett joined ARco in 1953 remaining until 1954 when he was called in the Service. After his release of tour of duty in 1955, he rejoined the engineering staff at ARco.

William A. Kelleher has joined The McGean Chemical Company of Cleveland as advertising manager. He is a graduate of the University of Notre Dame in 1941, majoring in advertising and art. Was formerly with The Ridge Tool Company of Elyria, Ohio, for five years as technical publications manager.

Leon Hurwitz has been appointed product manager of the metals processing department of the Hamilton Watch Co. Mr. Hurwitz, who has been with Hamilton for 10 years, was formerly chief metallurgist and in charge of the company's science laboratories. He holds a graduate degree in chemistry from Pennsylvania State University and is a member of the American Society for Metals, American Chemical Society and American Society of Tool Engineers. Before coming to Hamilton he was associated with Jones & Laughlin Steel Corp.

S. S. Wilson has been named executive vice president and general sales manager of Sel-Rex Corporation, Nutley, N. J., manufacturers of precious metals processes, metallic power rectifiers, airborne power equipment, and metal finishing equipment and supplies.

Mr. Wilson, a graduate of Penn State with a BS in Chemistry, was formerly vice president in charge of Sel-Rex's Detroit Office, and was responsible for all

Wilson

Mitwol

midwestern operations for the past three years. Prior to joining the company in 1949, he had been with Koppers Chemical Co. and Sennett Steel Corp.

Mr. Wilson will make his headquarters at Sel-Rex's new executive offices building located at 75 River Road, Nutley.

Sid Mitwol has been promoted to manager of the Sel-Rex Detroit office. Having joined Sel-Rex in 1948 as a sales engineer, Mitwol has progressed through positions of increasing executive responsibility, and was product sales manager for the firm's Rectifier Division prior to his current assignment.

A graduate Electrical Engineer of C. C. N. Y.'s School of Technology, Mitwol was formerly associated with Federal Telephone and Radio Co. and Radio Receptor Co., Inc.

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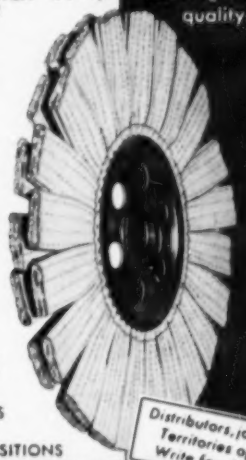

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AES Membership Report

ELECTIONS

Allentown-Reading: P. J. DeFrank
Baltimore-Washington: C. E. Freed, J. E. Judd, H. I. Salmon
British Columbia: A. D. Titmuss, A. C. Vriends
Capitol District: D. F. Dagnoli, S. V. D'Andrea, G. P. Irvine, R. H. O'Connor
Central Michigan: A. D. Webb
Chicago: R. J. Bezak, C. F. Finkler, T. J. Gotkowski, A. Greenblatt, E. Lash, V. A. Lauter, W. Lopotko, D. J. Manning, M. D. Mitchell, R. W. Seligmann
Cincinnati: F. E. Fuller, B. L. Miller
Columbus: C. F. Bunyon, D. B. Wells
Dayton: G. C. Mackenzie, T. E. Vogt
Hartford: F. W. Carmon
Los Angeles: L. E. Barkley, J. M. Rafferty
Milwaukee: E. B. Brown, V. C. Germane
Mohawk Valley: G. E. Blanchard, H. A. Blum, T. DeJoseph, J. P. Donovan, C. A. Higgerso, R. Howard, W. G. Jezowski, J. F. Lewis, J. F. Luker, J. Marchetta, T. Patrick, B. A. Stewart, M. W. Warren
Montreal: M. Baillargeon, G. P. Barrell, J. Bellemare, R. Dubois, M. Kahan, P. Larue, L. P. Mansueu, C. D. Reisenburg, L. Seery, J. Venturi
Newark: A. A. Agostine, C. A. Busacco, J. B. Hall, C. F. Ivins, Jr., A. H. Lott, Jr., G. M. Loucas, J. Mickiewicz, John P. Nichols, C. Rack
Philadelphia: J. M. Brady, H. A. Evangelides, R. D. Lozenski, T. J. Mackus
Rochester: R. A. Harold
Rockford: C. T. Bogin
Saginaw Valley: W. A. Burness
St. Louis: M. R. James
San Francisco: J. O. Berger, J. E. Cosgrave, W. V. Ferry, W. T. Fullbright, L. V. Logher, K. Tharp
Southern Tier: C. W. Potter
Sydney: K. Deutsch
Syracuse: F. P. Hosley
Toronto: R. Corras, D. Humphries, J. Greening, F. Marks, R. E. McCausland, J. Webber
Waterbury: D. Paternostro, J. D. Patrick
Member-at-Large: R. Arciniega, Torrance, California; W. W. Tabler, Jackson, Mississippi; P. A. Weinberg, Buenos Aires, Argentina; C. A. Witherspoon, Jr., Blacksburg, Virginia.

REINSTATEMENTS

San Francisco: C. R. MacDonald
Syracuse: H. Crouse
Toronto: R. P. Crawford

TRANSFERS

Chicago: G. H. Cook to Philadelphia, K. Edward to Cincinnati, C. M. Iwen to Montreal, O. P. Quist to Springfield
Columbus: D. J. Coffey from Dayton, M. Wise from Dayton, P. Woodberry to Boston
Dayton: B. R. Julien from Grand Rapids, K. D. Ford to Cleveland
Montreal: J. P. Courtemanche to Bridgeport
Newark: W. McLaughlin to Detroit
San Francisco: A. Augustin from Wichita
Southern Tier: M. Ihrie to Mohawk Valley
Springfield: E. J. Mahar to Member-at-Large
Syracuse: K. H. Baker, J. Benson, C. A. Bridgett, F. C. Brownell, H. Crouse, F. A. Czech, C. W. Fenner, R. Gros, P. Jankiewicz, K. R. Kidder, C. Manaseri, A. E. Overend, C. Raehm, W. Sacket, H. A. Schneur, G. Simmons, B. A. Tise, A. R. Wilbur, to Mohawk Valley
Member-at-Large: W. E. Lydick to Southeastern

RESIGNATIONS

Dayton: J. A. Keplinger
Melbourne: J. K. Avery
Rochester: J. Devlin, J. DeZimm, J. Duford, F. Wagner
Southeastern: W. W. McLain
Member-at-Large: J. W. White, West Monroe, Louisiana

SUSPENSIONS

Chicago: V. D. Elarde
Dayton: J. O. Cram, C. Santarello, Jr.
Newark: L. Brown, E. Earle, R. Griffin, E. LoPresti, M. Parisi, A. Ronzo, E. Walsh, P. Weidle
Rochester: J. Adams, F. Ciambrone, M. Kulp, L. Lipinski
Toronto: A. Murray

DEATHS

Chicago: A. Pochewicz
Newark: R. Clark

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BRANCH NEWS

Total AES Branches U. S., Canada, Australia, July 1, 1957—56.

BRIDGEPORT

Committee Chairman Appointed; Meetings on Prompt Schedule

The regularly scheduled business meeting and educational session of the Bridgeport Branch were held in the Main Ballroom of the Hotel Barnum on Friday, May 10, 1957. President **Tatum** called the meeting to order at 8:30 p.m., at which time 33 members and guests were present.

President Tatum appointed the following as chairmen of the designated committees. Christmas Dinner Dance, **George Eckholm**; Olde Timers Nite, **Richard Barrett**; Publicity, **William Lindsay**; Projector, **Philo Bailin**; Sick, **Harry Zingo** and **John Lehner**.

By unanimous vote the delegates to the annual convention were instructed to oppose any increase in national dues as proposed.

Meetings are to start promptly at 8 p.m. Should the business session not be completed by 9 p.m., the meeting shall be adjourned until after the scheduled speaker has completed his address.

The secretary was ordered to purchase one Branch Officers' Manual from the National Society; this Manual to remain in the custody of the president of the branch and passed to the succeeding president.

A rising vote of thanks was tendered **Robert Bonazzo** for his untiring efforts as chairman of the advertising committee for the New England Regional.

A letter from the national headquarters advising us that no honorary memberships would be conferred at the forthcoming annual convention was read by the secretary. In spite of this the delegates were instructed to press for the election of **Ray O'Connor** as an honorary member of the national society.

Henry Mahlstedt of Metal & Thermit Corp. was the featured speaker of the evening. He discussed "Crack Free Chromium" and supplemented his talk with excellent slides.

Bob Parker
Secretary-Treasurer

BRITISH COLUMBIA

Tour and Three Films Feature Final Seasonal Meeting

Over 30 members and their wives enjoyed the social get-together on June 19 at the British Columbia Building, P.N.E. grounds, which constituted the last general meeting of the 1956-1957 season.

After a short cocktail gathering in the lounge the party toured the upper exhibits in the building, including a ride on the gantry viewing the largest relief map in the Commonwealth, that of the province of British Columbia, in its entirety, under the guidance of Mr. Evans of the P.N.E.

This was followed by light refreshments in the lounge before the tour continued on the lower floors. The highlight of the evening was three films shown in the theatre: "Rival World," the remarkable insect film made by the Shell Corporation with its extreme closeups of insects in the process of eating; scenes from the "Great Chase" with W. C. Fields; and finally the wonderfully complete and colorful story "Mining for Nickel" produced by the International Nickel Company of Canada.

The first meeting of the 1957-1958 season will be held in mid-September.

J. Lee
Secretary

CHICAGO

Meet at New Location

The June meeting of the Chicago Branch was held at Nielsen's Restaurant.

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Authors of technical and scientific papers on electroplating, metal finishing and related arts are cordially invited to submit manuscripts of original, unpublished papers to the Editor of PLATING for review and publishing consideration.

Any such paper accepted and published in PLATING will also become eligible, of course, for selection by the Society's PAPER AWARDS COMMITTEE for the Carl E. Heussner Award, George B. Hogaboom Award, AES Bronze Medal Award, Robert S. Leather Award, Chromium Plating Award or the Precious Metal Plating Award.

Though the submission of any such papers by AES members or non-members will be welcomed by PLATING any time during the year, this current period is particularly recommended. So as to expedite review and other processing, please write the Editor, PLATING, 445 Broad Street, Newark 2, New Jersey, for full particulars before submitting your manuscript.

This restaurant was chosen because a majority of the members live north to northwest of its location. There was a good attendance of members at this meeting. After the social and dinner hour, **R. Scott Modjeska** gave a gala introduction of the speaker for the evening, **Paul Glab.**

Mr. Glab, who serves the branch as our secretary, is superintendent of Northwestern Plating Works in Chicago. The paper on "Barrel Finishing" was a joint effort of the Chicago Branch and will be presented at the annual convention in Montreal. Mr. Glab spoke about the different types of barrels used for plating, (1) oblique type: single and those used in fully automatic machines, (2) horizontal type: single and those also used in fully automatic machines. With the aid of slides, he discussed the various automatic plating machines and the different methods of cooling barrel plating solutions such as heat exchange and refrigeration systems. He also discussed the various cleaning and pickling systems with the use of barrels. The talk was very interesting and well illustrated, and an informative question and answer period followed.

Christopher Marzano
Publicity Chairman

CINCINNATI

Annual Picnic Big Success

Ken Edstrom, Earl Leonhardt and **Roger Winterman** prepared and executed one of the finest picnics the Cincinnati Branch has ever had.

Seventy-four members and guests gathered at Kolping's Grove on Saturday, June 8, 1957. The afternoon festivities began with a horseshoe tournament which was won by the team of **Bud Strotman** and **Dave Kaplan.** The egg tossing contest was won by the team of "Nimble Fingers" **Dale Stapleton** and "Rubber Knuckles" **Bob Osborn,** two of our student members.

The high point of the afternoon was the annual ball game. **Stew Chipman's** "Suppliers," did not have quite enough this year as **Bob Dean's** "Platers" won 5-4, to avenge last year's defeat.

After munching on Bar-B-Q sandwiches in the afternoon, the "boys" dug into the charcoal grilled steaks for supper, and then settled down for a sociable evening around the card tables. The more fortunate guests had their names drawn for one of the many door prizes.

The branch members have now turned their full attention to the next task at hand: The 45th Annual Convention. Remember! It's Cincy in '58.

David L. Kaplan
Secretary

COLUMBUS

New Officers Installed

The regular May meeting and annual banquet of the Columbus Branch was held in the New Orleans Room at the Jai Lai Cafe on Thursday, May 9, 1957 at 7:00 p.m. Forty-four members and wives attended.

President **Bill Shriver** thanked the members for their cooperation during the past year.

Two candidates were duly approved and elected as members.

Nat Koslin presented the newly elected officers for 1957-58 and **Bill Neill** conducted the installation of: President **Calvin Smith,** 1st Vice President **Michael Farr Jr.,** 2nd Vice President **Marvin Pingel,** Secretary **Halvor Christianson,** Treasurer **Harry L. Moore,** Librarian **Jack Spenard;** Board of Managers: **William Shriver, Walter Denney, William Safranek;** Delegates: **William Neill, Nathan Koslin, Walter Denney;** Alternates: **William Safranek, Charles Faust, John Beach.**

Nat Koslin introduced the speaker **Thomas H. Dudgeon** of Nationwide Insurance Company whose topic was "Barriers to Communication."

Halvor S. Christianson
Secretary

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DAYTON

Stag Party Enjoyed

The Dayton Branch held a very enjoyable Stag Party, June 5 at the Moraine Products Gun Club as a fitting climax to a very successful year. The party lasted from 5 p.m. 'til midnight, starting with an excellent buffet supper. Entertainment for the evening consisted of ping-pong, movies, cartoons etc., and card playing—with plenty of liquid refreshments.

Thirty-eight members and friends had an enjoyable time.

Two new members were added to the roll.

R. M. Clinchens
Secretary

INDIANAPOLIS

Branch Educational Meeting Will Not be Held in 1958

In spite of very bad "winter" weather, twenty-five members met at Fox's Steak House for the regular meeting on April 3.

Marshall Whitehurst opened the meeting with introductions.

Les Reynolds reported that early indications of Tri-State finances should be on the plus side. He also expressed appreciation to all who helped on the various committees to achieve the success of the March 30 meeting. Tri-State officers suspended Article III for 1958 in order to continue with present officers, but each branch must elect a new junior member. **Herb Kennedy** advised that **Ezra Blount** of Cincinnati expects Indianapolis Branch to supply 2 or 3 members for the Educational Committee for the '58 Convention.

John Holland made a motion that Indianapolis will not hold any educational session dinner-dance program for '58 because of the obligation due to the Cincinnati branch for '58 Convention. This motion was seconded and carried.

Ed Bruck made a motion that Indianapolis Branch express appreciation to Les Reynolds and all of the other active workers of the Tri-State meeting at French Lick, Indiana.

Dave Sivertsen reported the Paper Committee would be ready with all the details at the May meeting.

Loren Stevens introduced one of our own members, **Robert Van Houten** who discussed "The Atom at Oak Ridge and Elsewhere." Mr. Van Houten had attended "Oak Ridge School of Reactor Technology" which is a school for training or acquainting of men with various types of reactors.

First, our speaker gave us some of the local color of the Oak Ridge section of Tennessee, geographically and of population. Hillbillies and ridge-runners are actual inhabitants, not just fictitious characters. Most of the Oak Ridge employes and those in training are younger people with college degrees and they have many clubs and activities.

Since there are several stages of processing the raw material, Oak Ridge has many large buildings or plants for each stage of the process. Electric power is such a large factor that they estimate one-fifth of all the electric power generated in the U. S. is consumed by atomic energy projects within the U. S.

In the reactor laboratories, atomic radiation is such a great hazard that workers must work behind 5-foot thick shields, use remote control devices, and wear film strips which must be checked every few days.

A "Reactors Safe Guard Committee" studies and checks all possible conditions to minimize the danger of operation of reactors and run away or bomb disaster. In case of bomb disaster light clothing is much better than dark clothes, dust fallout is very dangerous, and even an old fashioned storm cellar would need a very good dust filter, besides supplies for several days.

The question of cost of using atomic power to generate electricity is not too far out of line in areas where coal is high and installation cost can be spread over many years.

All enjoyed Mr. Van Houten's talk. The meeting adjourned 9:55 p.m. A Board of Managers meeting followed.

Paul Freeman
Secretary

INDIANAPOLIS

Hawbee Elected President

Twenty-four members were present at the May 1, 1957, meeting at Fox's Steak House.

Fritz Anderson reported that the Tri-State meeting turned out a financial success.

Photo courtesy: Hanson-Van Winkle-Munning Co.

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Election of officers for 1957-58 followed with the following results: President, **Bert Hawhee;** 1st Vice President, **John Hood;** 2nd Vice President, **Loren Stevens;** Secretary, **Paul Freeman;** Treasurer, **John Holland;** Librarian, **Addison Howard.** Board of Managers: **Robert Smith, Roman Bender,** and **Robert Van Houten.** Delegates to Tri-State: Sr.—**Fritz Anderson Jr.**—**Quentin Shockley.** Delegates to National Convention: **John Hood, John Holland,** and **Paul Freeman.**

Votes were tallied by **Edna Rohrabaugh** and **Herb Kennedy.**

Loren Stevens presented **Dave Sivertsen,** one of our own members, who gave us a first-hand view of the paper "The Plating of High Density Tungsten Metal Alloys" which is a joint work with **G. R. Van Houten.**

P. R. Mallory produces a tungsten alloy containing a small amount of nickel and copper which can be fabricated by pressed powder and sintering techniques.

Electroplating this Mallory 1000 material is very little different than any other steel or similar part. Chrome plating this material can follow the copper flash, nickel then chrome with ordinary procedures. Cadmium plate for corrosion resistance can be applied directly on cleaned part. Some of these alloy parts were heat treated to test the plating and any flaws. Parts which received a copper base coat give indications of the best adhesion. Where the part is not subject to extreme heat ordinary plating thickness prove just as satisfactory as for any other similar part. This high density tungsten alloy does not show any porosity, which is the main reason it is as easy to plate as any other solid material.

Several questions and answers followed and all present learned many new items.

Quentin Shockley made a motion to thank our retiring president, **Marshall Whitehurst,** which was seconded and carried by a standing vote.

Bert Hawhee will preside at the next meeting in September.

Paul Freeman
Secretary

LOUISVILLE

Joe Sterling to be Honored

The regular monthly meeting of the Louisville Branch was held Thursday, April 18, 1957 at Hasenour's Dining and Cocktail Lounge with a dinner served at 6:30 p.m. and business meeting at 8. There were 21 members and guests present. Guests included **Herbert Rembold,** Home Laundry Dept., General Electric Co. President **K. C. Reifsteck** turned the meeting over to the new president, **J. S. Houston.**

Past Technical Chairman J. S. Houston reported that next month's meeting will consist of a plant tour of the Clayton & Lambert Mfg. Co. Ordnance Plant.

Tri-State Regional Committee member K. C. Reifsteck reported on the annual Tri State Regional Meeting held at French Lick, Indiana on March 30. He stated that there would be no Tri-State function in 1958 due to the National Convention being held in Cincinnati at that time. The next Tri-State Regional Meeting will be held in Louisville in 1959. The Tri State Committee membership will remain unchanged until 1959.

Dick Marshall suggested that the local branch hold a "Joe Sterling Night" to show our appreciation for the long and valued service rendered by this member. It was unanimously agreed to hold such an affair, but it will be necessary to wait until Fall.

President Houston introduced the moderator, **Miss Ella Willuweit** of Clayton & Lambert Mfg. Co., Louisville, Kentucky. An extremely interesting round table discussion followed with most of the discussion concerned with zinc plating. Miss Willuweit provided graphs, slides, and photos describing various conditions of zinc plating. She proved to be an excellent moderator since the meeting did not adjourn until 12:10 a.m.

R. G. Marshall
Secretary-Treasurer

MELBOURNE

Trends in Metal Cleaning Heard

After a showing of films, President, **K. Howard** opened the May 16 meeting at 8:30 p.m. There were 58 members and visitors present.

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The technical program began with **J. Christian** introducing **R. K. Whiteley,** general manager of Turco (Aust) Pty. Ltd., who lectured on "Trends in Metal Cleaning."

Mr. Whiteley explained the basic fundamentals of cleaners and their formulation for removal of various soils from metal.

The latest developments were covered, these being mainly Di-phase and ultrasonic cleaners. Mr. Whiteley demonstrated an alkaline rust and scale remover used electrolytically on steel, this proved to be very efficient.

An interesting discussion period followed, and after a vote of thanks by **B. Johnston** the meeting closed at 9.50 p.m.

MILWAUKEE

McCoy Heads New Officers

The 479th meeting of the Milwaukee Branch was called to order by President **Herman Tessman** on May 10, 1957 at the Ambassador Hotel at 8 p.m. Two new members were elected.

Glen Schwemer was requested to give a report on the Annual Meeting. A tentative verbal report was given. A formal report will be submitted at a later date. It was also announced at this time that the arrangements were completed for the Annual Pabst Blue Ribbon meeting to be held June 5.

Fred Anderson, manager in charge of the annual meeting, availed himself of the opportunity to thank all the men who were responsible for the success of the Annual Meeting. A rising vote of thanks with applause was accorded the chairman and his committee.

The president named the following members to serve on a committee to select a new meeting place needed for the branch's expanded activities: **Herman Tessman, Eugene Piellusch, Frank Marshal.**

Leslie Dively asked for a discussion of proposed changes to the National Constitution, regarding an increase in the Per Capita Tax. It had been verified that although expenses on the National level had increased there was no corresponding increase in the Per Capita Tax. Following membership discussion, it was moved, seconded and passed that the delegates be instructed to vote for a two dollar increase in the Per Capita Tax.

A letter was read from the Newark Branch regarding the candidacy and qualifications of **W. A. Wesley** for the office of 3rd vice president. At this point Leslie Diveley summarized the list of all the candidates for National 3rd vice president and a discussion of the matter was held by the membership. **Clifford Peter** moved that the delegates go to the convention uninstructed.

Election of branch officers was the next order of business.

The following men were elected by acclamation: **E. H. McCoy,** president; **F. Marshall,** 1st vice president; **C. Doria,** 2nd vice president; **S. Taterzynski,** secretary-treasurer; **E. Piellusch,** librarian. **Art Linn** was elected to the Board of Managers.

The educational chairman presented the speakers for the evening. **A. H. Kirkpatrick,** sales and service engineer for Frederic B. Stevens Inc., spoke to the Inorganic Section on "The Big Squeeze in the Plating Industry" and **G. I. Stoddard,** training consultant for The DeVilbiss Company, spoke to the Organic Section on "Manual Spraying Techniques."

S. R. Taterzynski

MOHAWK VALLEY

New Branch Meets

On March 11, a meeting was called to establish a local Utica area branch of the AES. **Frank Czech** acted as temporary chairman. The meeting was attended by some 36 area men interested in applying for a temporary charter. It was obvious to all attending that it would be advisable to proceed with the plan.

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On April 11, a very successful meeting was held at Grimaldi's Restaurant in Utica. A group of 58 men enjoyed dinner and the business meeting was attended by 70 men. We were privileged to have visiting members from Syracuse, Rochester, Buffalo, Capitol District and triple cities Branches.

A formal election was held and the following slate of officers was elected on a permanent basis: Frank Czech, president; **Charles Bridgett,** 1st vice president; **Jack Benson,** 2nd vice president; **Charles Raehm,** secretary-treasurer; **George Simmons,** librarian. Board of Managers: **Merwin Warren, Charles Higgerson, Robert Stewart, James Lewis, Walter Sackett.**

Jerry Lux of Oakite Products Inc. was the main speaker of the evening and was enjoyed by all. His subject was "Some Basic Fundamentals of Alkaline Cleaning in Industry."

On May 9, the newly formed group held its second formal meeting at Grimaldi's Restaurant in Utica. Dinner was enjoyed by some 30 men and the business meeting was attended by 55 area participants.

J. Gordon Seiter, of Stokes Machine Co., Philadelphia, was the main speaker of the evening. His subject was "Vacuum Metalizing."

During the meeting the group voted to have a plant tour in September and arrangements will be made during the next few months.

At this writing, our newly formed Utica Area Mohawk Valley Branch, has made application for its Temporary Charter, presenting a total membership of 34 thus far. We have seventeen transfers of members from Syracuse Branch and seventeen new members since we began.

Just between you and me, you shall hear a lot more from the Mohawk Valley Area in the future. See you at Montreal.

Charles P. Raehm Jr.
Secretary-Treasurer

NEWARK

Visit Bud Plant

The May meeting of the Newark Branch was held at the Anheuser-Busch Brewery in Newark with some fifty members present.

The meeting was primarily concerned with the important job of sampling and your reporter can state that the problem was assiduously attacked. After a tour of the brewery, several films were observed and a short business meeting was held with Vice President **Dodd Carr** presiding. Four new members were elected. **John Lavery**—first time in three years—and all the others who braved the record heat and humidity appeared to enjoy the sampling study immensely.

D. Gardner Foulke
Secretary

SAN FRANCISCO

Plan August Picnic

The regular monthly meeting of the San Francisco Branch was held at Pastori's in Redwood City, June 11, 1957. Guest at the meeting was **Harold R. Smallman** of the Los Angeles Branch. Two new members were announced. Plans were laid for the annual picnic in August. The next meeting will be a tour of Pan American World Airways overhaul shop, through the courtesy of **Ed Schultz** and **J. T. Trippe.**

Arthur Schwartz
Secretary

TOLEDO

Bergeman Night

The last monthly meeting of the fiscal year of the Toledo Branch was held on Thursday, June 6, at Angelo's Spaghetti House. Thirty members (65 per cent of the membership) were present for the dinner honoring the retiring secretary, **Gaston Bergeman,** who served so faithfully in that post for twenty years. The climax of this affair came when the membership presented Gaston with a set of luggage. After the business meeting, this affair continued as a party under the chairmanship of **Harold Grutter.**

The business meeting was opened by the newly elected president, **Merlin Parker.** Introduction of the other new officers was made by the president: 1st vice president, **James Follas;** 2nd vice president, **Julius Bach;** secretary, **Ben Gomersall;** treasurer, **James Vandertill;** librarian, **Wallace E. Fridel;** Board of Managers, **Gaston Bergeman, Gayle Goldsworthy** and **Donald Dettinger.**

A brief review of the talk which had been given by **Edward Bride** of Diamond Alkali Company on "Chromium Plating Up to Date" and by **J. B. Winters** of INCAR, Inc., on "Bright Cadmium and Zinc Barrel Plating" was given by the secretary at the request of the membership.

The question "What does the Toledo Branch have to offer prospective members as an inducement to join?" led into a very lively and beneficial discussion which should rocket off the Fall Membership Drive with the best results in years.

Ben Gomersall
Secretary

MANUAL AVAILABLE TO BRANCHES

The AES's consolidated mimeographed looseleaf book Branch Officer's Manual has been completed and copies have issued from National Headquarters to all Branches that ordered them at $5.50 per copy.

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A limited extra quantity of the book is still available at National Headquarters for the accommodation of Branches that have not previously ordered copies. These will be sold to Branches (only), on a first-come, first-served basis so long as that supply lasts, at $5.50 per copy, including postage to one destination.

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MAIL BOX

(Continued from page 853)

DEAR SIR:

The Dayton Branch is planning a past presidents' night for September but due to loss of old records do not know the Branch Presidents for the years 1921 through 1936. We have canvassed our own members without luck.

In the hope that some of our members who have transferred or some records in other Branches may throw light, we would like to ask if it would be possible to have a notice printed in PLATING asking that any information be passed along to us. Thanks.

RICHARD M. CLINEBENS
Secretary, Dayton Branch

Ed. Note: If you are such a former member and have any of these data, will you please send them to PLATING for relay to the Dayton Branch. Thanks in advance.

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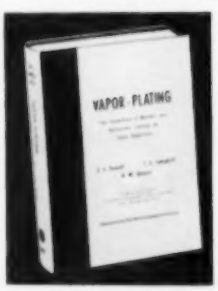
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FUTURE MEETINGS

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September 6—**Editorial Board Meeting,** AES Headquarters, Newark, N. J.

September 21-22—**Executive Board Meeting,** Hotel Statler, Detroit, Mich.

September 25—**Research Committee Meeting,** AES Headquarters, Newark, N. J.

November 2—**Philadelphia Branch,** Annual Educational Session and Banquet, Penn Sheraton Hotel, Philadelphia, Pa.

February 14-15, 1958—**Southeastern Branch,** 3rd Annual Technical Session, Dinkler-Plaza Hotel, Atlanta, Ga.

May 19-22, 1958—**45th AES Annual Convention,** Sheraton-Gibson Hotel, Cincinnati, Ohio

June 14-18, 1959—**46th AES Annual Convention,** Detroit, Mich.

July 10-14, 1960—**47th AES Annual Convention,** Hotel Statler, Los Angeles, Calif.

INTERSOCIETY

September 9-13—**12th Annual Instrument-Automation Conference and Exhibit,** Cleveland Auditorium, Cleveland, Ohio

September 23-25—**American Society of Mechanical Engineers,** Fall Meeting, Hotel Statler, Hartford, Conn.

October 6-10—**Electrochemical Society,** Fall Meeting, Statler Hotel, Buffalo, N. Y.

October 9-11—**4th Annual Symposium of High Vacuum Technology,** Hotel Somerset, Boston, Mass.

November 4-8—**39th National Metal Exposition and Congress,** International Amphitheatre, Chicago, Ill.

November 13-16—**National Association of Corrosion Engineers,** Miami Section, Key Biscayne Hotel, Key Biscayne, Fla.

January 28-31, 1958—**Society of Plastic Engineers, 14th Annual Technical Conference,** Sherton-Cadillac Hotel, Detroit, Mich.

February 10-14, 1958—**American Society of Testing Materials,** Committee Week, Statler Hotel, St. Louis, Mo.

June 22-28, 1958—**American Society for Testing Materials,** Annual Meeting and Exhibit, Hotel Statler, Boston, Mass.

See June 1957 Plating
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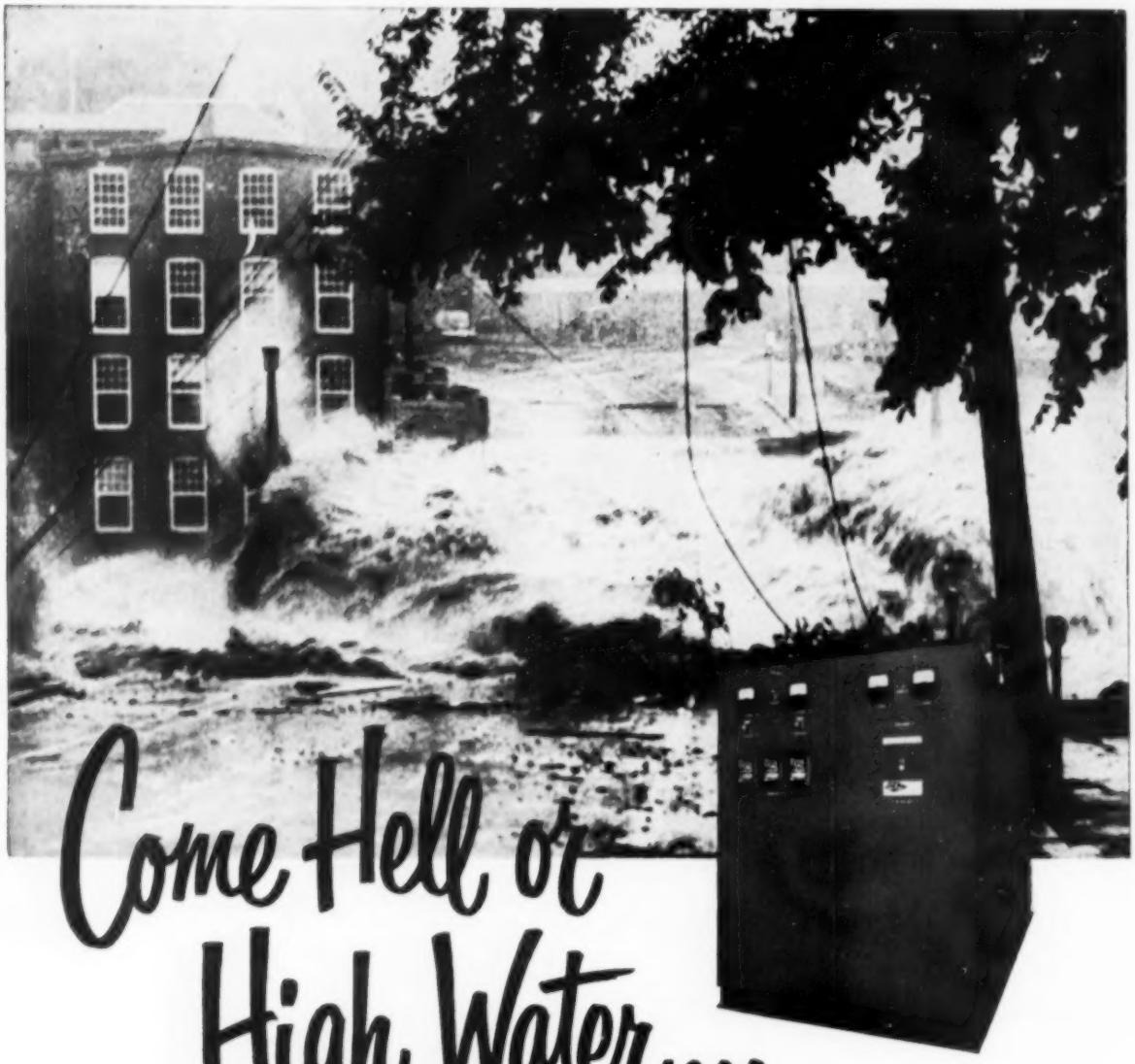

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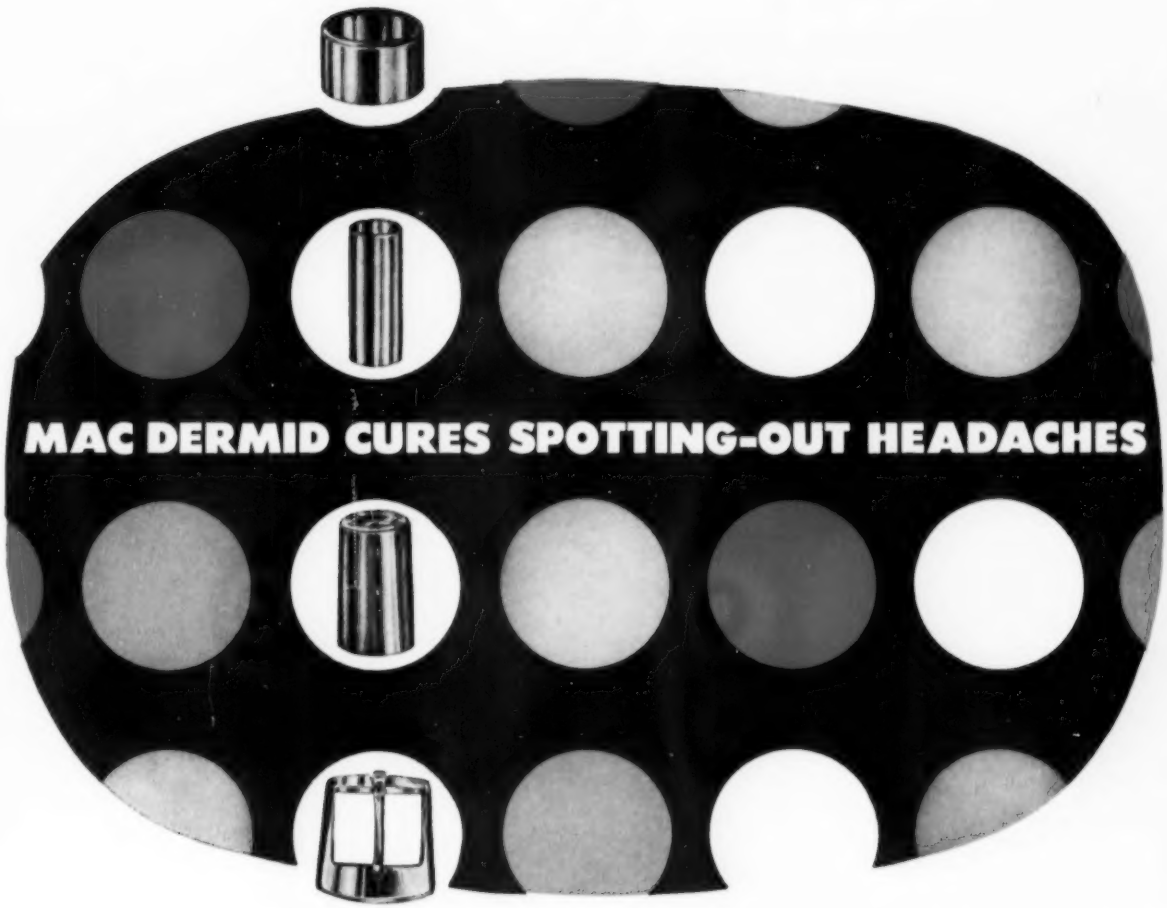

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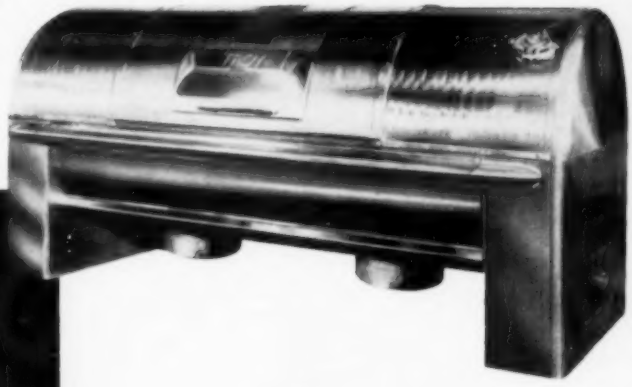

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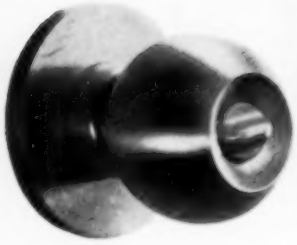

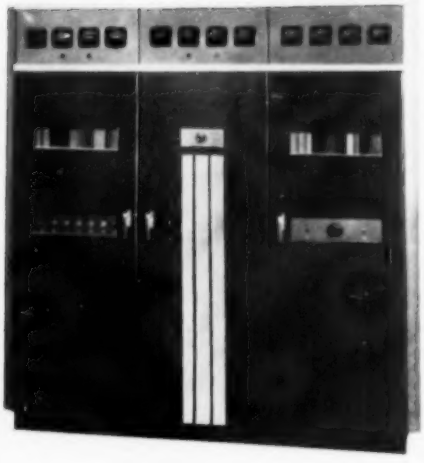

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